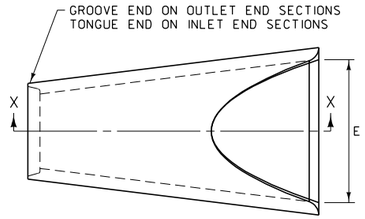
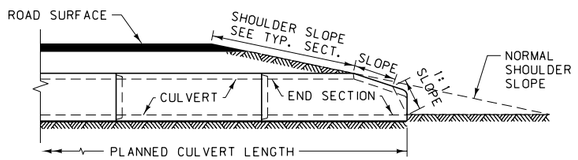
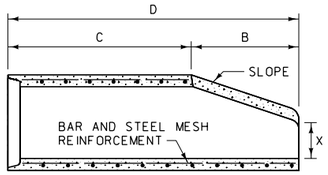
TYPE "A"



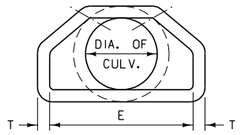
PLAN



SLOPE DETAIL



SECTION X-X



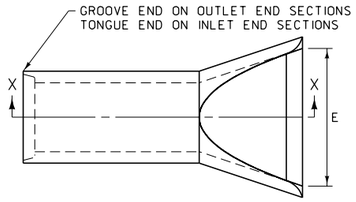
END VIEW

TYPE "A"							
DIA.	SLOPE	X	B	C	D	E	T *
12"	2.4:1	4"	2'-0"	4'-0"	6'-0"	2'-0"	2"
15"	2.4:1	6"	2'-3"	3'-9"	6'-0"	2'-6"	2¼"
18"	2.3:1	9"	2'-3"	3'-9"	6'-0"	3'-0"	2½"
24"	2.5:1	9½"	3'-7½"	2'-4½"	6'-0"	4'-0"	3"
30"	2.5:1	1'-0"	4'-6"	1'-6"	6'-0"	5'-0"	3½"
36"	2.5:1	1'-3"	5'-3"	2'-11"	8'-2"	6'-0"	4"
42"	2.5:1	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"
48"	2.5:1	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"
54"	2.0:1	2'-3"	5'-5"	2'-9½"	8'-2½"	7'-6"	5½"

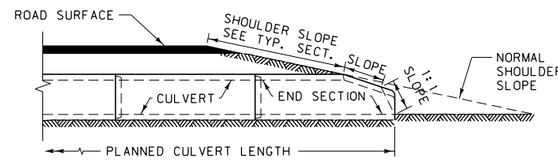
* WALL "B" THICKNESS

TOLERANCES IN THE ADJACENT TABLES MAY NOT VARY MORE THAN ±1.5% FOR THE DIMENSIONS SHOWN. OTHERWISE THEY MUST CONFORM TO AASHTO M 170.

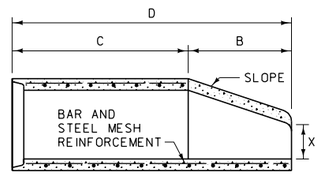
TYPE "B"



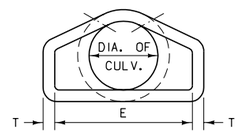
PLAN



SLOPE DETAIL



SECTION X-X

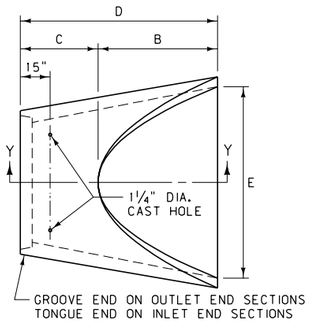


END VIEW

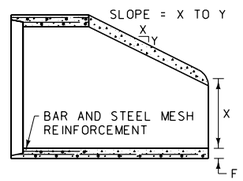
TYPE "B"							
DIA.	SLOPE	X	B	C	D	E	T *
12"	2.4:1	4"	2'-0"	4'-0"	6'-0"	2'-0"	2"
15"	2.4:1	6"	2'-3"	3'-9"	6'-0"	2'-6"	2¼"
18"	2.3:1	9"	2'-3"	3'-9"	6'-0"	3'-0"	2½"
24"	2.5:1	9½"	3'-7½"	2'-4½"	6'-0"	4'-0"	3"
30"	2.5:1	1'-0"	4'-6"	1'-6"	6'-0"	5'-0"	3½"
36"	2.5:1	1'-3"	5'-3"	2'-11"	8'-2"	6'-0"	4"
42"	2.5:1	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"
48"	2.5:1	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"
54"	2.0:1	2'-3"	5'-5"	2'-9½"	8'-2½"	7'-6"	5½"

* WALL "B" THICKNESS

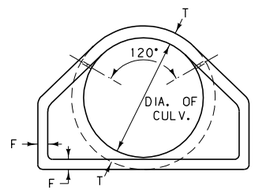
LARGE DIAMETER PIPE



PLAN



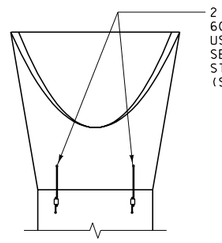
SECTION Y-Y



END VIEW

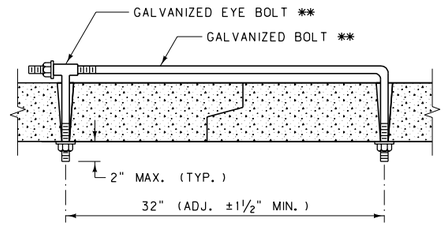
LARGE DIAMETER CULVERT								
DIA.	SLOPE	T *	X	B	C	D	E	F
60"	1.9:1	6"	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66"	1.7:1	6½"	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72"	1.9:1	7"	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78"	1.8:1	7½"	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84"	1.5:1	8"	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90"	1.5:1	8½"	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"

* WALL "B" THICKNESS



2 TIE BOLTS EACH AT 60° TO THE VERTICAL, USED TO TIE END SECTION TO ADJACENT STRAIGHT SECTION. (SEE TIE BOLT DETAIL.)

TIE BOLT CONNECTION



** ¾" FOR 12" TO 54" DIA. RCP
1" FOR 60" TO 84" DIA. RCP

TIE BOLT DETAIL
(TWO PER END SECTION)

TIE BOLTS: USE TWO TIE BOLTS ON ALL FLARED END SECTIONS, ONE ON EACH SIDE AT 60° TO THE VERTICAL. GALVANIZE ALL PARTS. SEE TIE BOLT DETAIL.

CONSTRUCTION: CONSTRUCT ACCORDING TO CLASS III, AASHTO M 170, AS FAR AS DESIGN WILL PERMIT.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 603, 708

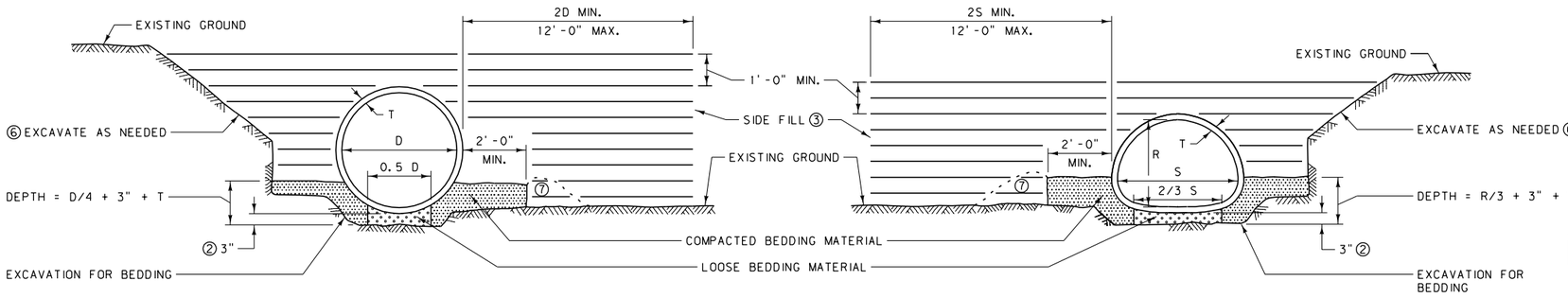
DWG. NO. 603-08

PREFABRICATED RCP FLARED END TERMINAL SECTION (FETS)

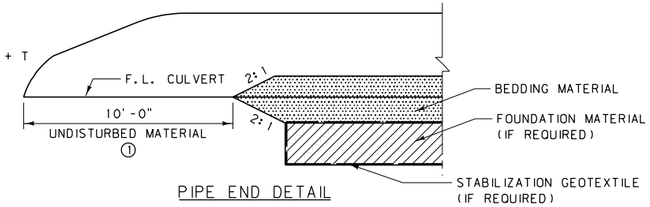
--REVISED--
January 2008

EFFECTIVE: FEBRUARY 2005

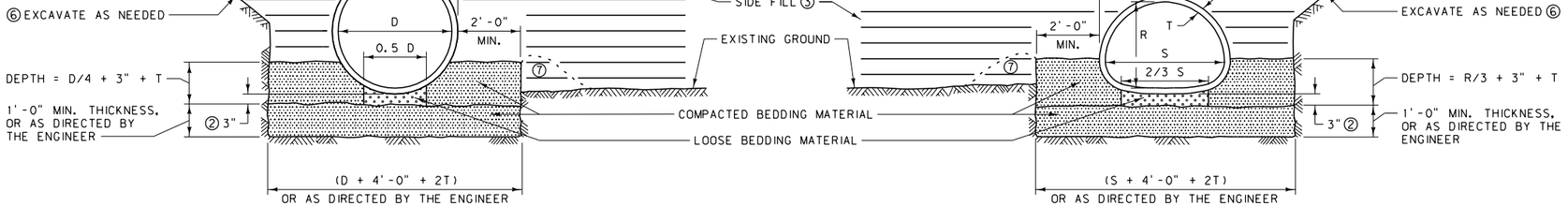
MONTANA DEPARTMENT OF TRANSPORTATION
serving you with pride



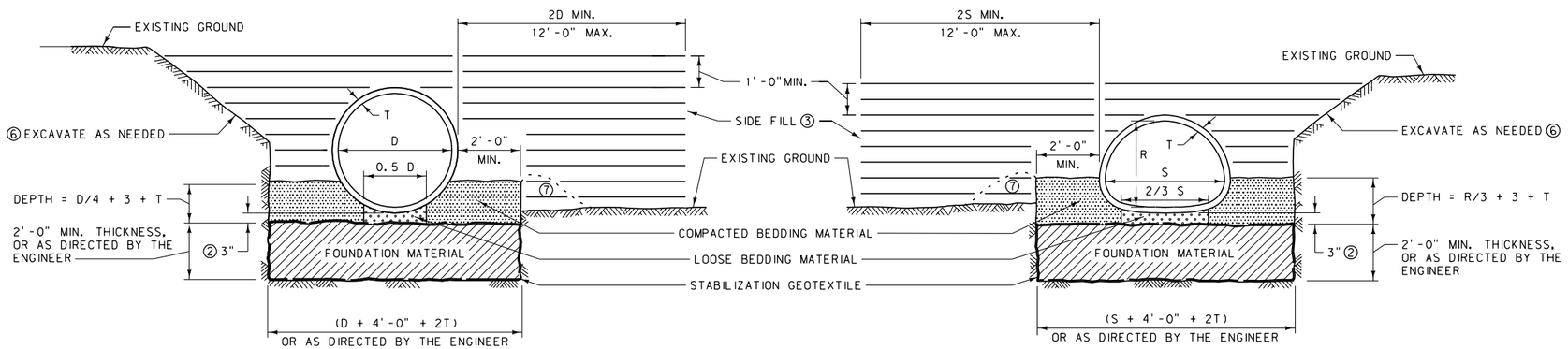
1-STANDARD BEDDING INSTALLATION



PIPE END DETAIL



2-ROCK



3-FOUNDATION STABILIZATION

NOTES:

① DO NOT EXTEND BEDDING MATERIAL TO THE END OF THE PIPE. LEAVE 10' OF UNDISTURBED MATERIAL AT EACH END UNLESS OTHERWISE NOTED IN PLANS. SEE PIPE END DETAIL.

② PLACE LOOSE BEDDING MATERIAL UNIFORMLY IN THE BOTTOM OF THE TRENCH AND SHAPE TO FIT BOTTOM OF PIPE. THE MINIMUM THICKNESS BEFORE PLACING PIPE IS 3". 42" AND 48" RCP IRR. REQUIRE 4" DEPTH OF LOOSE BEDDING MATERIAL TO ACCOMODATE BELL THICKNESS. AFTER LAYING CULVERT, COMPACT BEDDING MATERIAL AT HAUNCHES AND SIDES OF PIPE.

③ COMPACT SIDE FILL IN 6" LOOSE LAYERS TO DENSITY SPECIFIED FOR ADJACENT EMBANKMENT. SEE SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS FOR THE DENSITY REQUIREMENTS.

④ SEE SECTION 701.04 OF THE STANDARD SPECIFICATIONS FOR BEDDING AND FOUNDATION MATERIAL REQUIREMENTS.

⑤ DIMENSIONS D, S AND R ARE INSIDE PIPE DIAMETER, SPAN AND RISE. DIMENSION T IS THE CULVERT SHELL THICKNESS FOR CONCRETE OR CORRUGATION WIDTH FOR METAL. CORRUGATION WIDTHS ARE TYPICALLY ½" FOR 48" EQUIVALENT SIZE METAL CULVERTS AND SMALLER.

⑥ EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

⑦ BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE BEDDING MATERIAL TO THE PROPER DEPTH.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 207, 603, 701

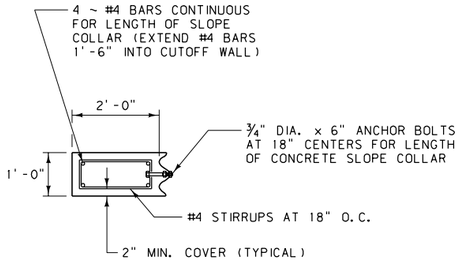
DWG. NO. 603-18

BEDDING FOR MAINLINE & PUBLIC APPROACH CULVERTS 48" EQUIVALENT & SMALLER

--REVISED--
January 2008

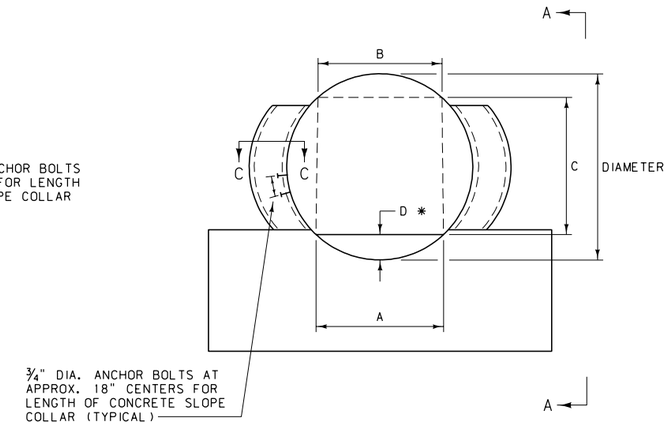
EFFECTIVE: APRIL 2006

MDT serving you with pride — MONTANA DEPARTMENT OF TRANSPORTATION

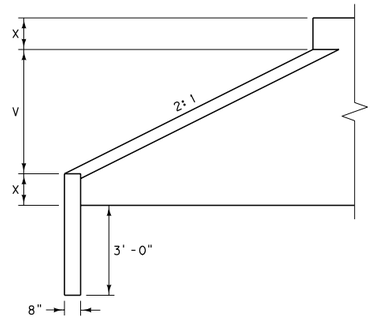


NOTE:
SEE DTL. DWG. NO. 552-00
FOR ANCHOR BOLT DETAILS.

SECTION C-C



ELEVATION



SECTION A-A

NOTES:

DESIGNATE THESE STRUCTURES, IN PLANS AND PROPOSAL, AS "VEHICULAR UNDERPASS." CONFORM MATERIALS, INSTALLATION, AND OTHER PROVISIONS TO THE STANDARD SPECIFICATIONS. USE THE TERM "VEHICULAR UNDERPASS," REGARDLESS OF THE USE OR PURPOSE OF THE STRUCTURE.

PROVIDE END TREATMENT FOR ALL VEHICULAR UNDERPASSES INCLUDING CUTOFF WALLS, BACKFILL RETAINING WALLS AND CONCRETE SLOPE COLLARS.

PROVIDE SURFACING FOR THE INSIDE OF THE STRUCTURE, CROSS-SLOPED TO ALLOW A DRAINAGE COURSE ALONG ONE SIDE.

FOR PLATE THICKNESS SEE ROAD DESIGN MANUAL FILL HEIGHT TABLES.

USE CLASS "DD" CONCRETE OR EQUAL.

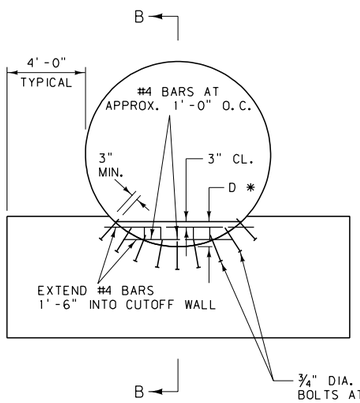
SEE DTL. DWG. NO. 552-08 FOR QUANTITIES.

DEPTH OF SURFACING *		
MATERIAL	ALTERNATE "A"	ALTERNATE "B"
PL. MIX SURF.	—	0.20'
CRUSHED AGGREGATE COURSE	BAL.	BAL.

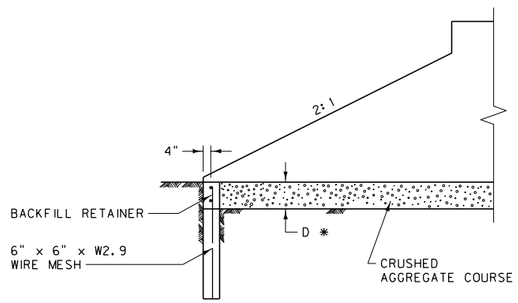
DIAMETER	A	B	C	V	X	* D	BACKFILL RETAINER (C.Y.)	CONCRETE COLLAR (C.Y.)
96"	4'	4'	6.9'	4.0'	2.0'	0.5'	0.04	0.66
120"	7'	7'	7.1'	5.0'	2.5'	1.4'	0.17	0.82
150"	10'	8'	8.6'	6.25'	3.13'	2.5'	0.43	1.08
162"	10'	8'	10.0'	6.75'	3.38'	2.2'	0.38	1.16
186"	12'	10'	10.8'	7.75'	3.88'	2.9'	0.59	1.34
192"	12'	10'	11.5'	8.0'	4.0'	2.7'	0.55	1.38
204"	12'	10'	12.9'	8.5'	4.25'	2.5'	0.51	1.46
216"	12'	10'	14.2'	9.0'	4.50'	2.3'	0.47	1.54
228"	16'	12'	12.5'	9.5'	4.75'	4.4'	1.23	1.72
240"	16'	12'	14.0'	10.0'	5.0'	4.0'	1.10	1.72

	SURFACING QUANTITIES PER LINEAR FOOT FOR DEPTH "D" *						
	ALTERNATE "A"	ALTERNATE "B"					
	C.Y. SURFACING	TONS SURFACING		C.Y. SURFACING	TONS BIT. MATL.		
DIAMETER	CRUSHED AGGREGATE COURSE	COVER MATERIAL	PLANT MIX	CRUSHED AGGREGATE COURSE	PLANT MIX	PRIME	SEAL
96"	0.054	0.0056	0.052	0.027	0.0031	0.0005	0.0007
120"	0.255	0.0097	0.097	0.205	0.0058	0.0009	0.0012
150"	0.647	0.0139	0.141	0.574	0.0084	0.0014	0.0017
162"	0.563	0.0139	0.140	0.489	0.0084	0.0014	0.0017
186"	0.882	0.0167	0.169	0.794	0.0102	0.0017	0.0020
192"	0.830	0.0167	0.168	0.744	0.0101	0.0016	0.0020
204"	0.769	0.0167	0.169	0.680	0.0102	0.0016	0.0020
216"	0.702	0.0167	0.168	0.615	0.0101	0.0016	0.0020
228"	1.842	0.0222	0.227	1.725	0.0136	0.0022	0.0026
240"	1.656	0.0222	0.226	1.539	0.0136	0.0022	0.0026

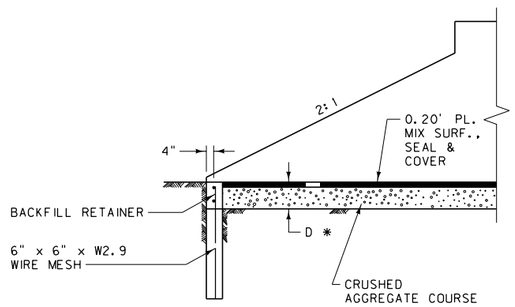
BACKFILL RETAINER & CUTOFF WALL DETAIL



ELEVATION



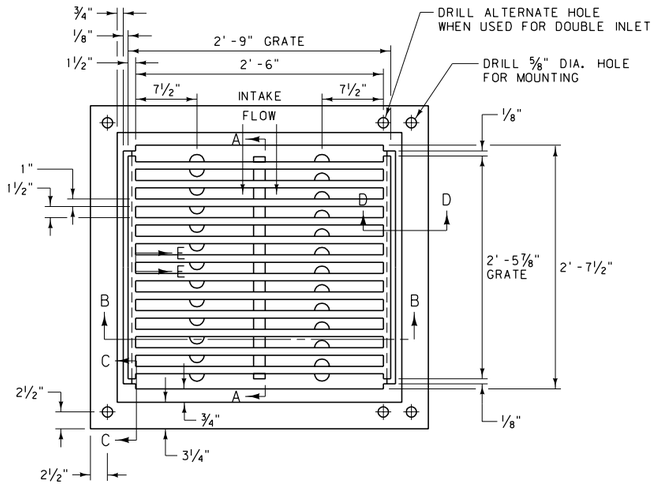
SECTION B-B
(ALTERNATE "A")



SECTION B-B
(ALTERNATE "B")

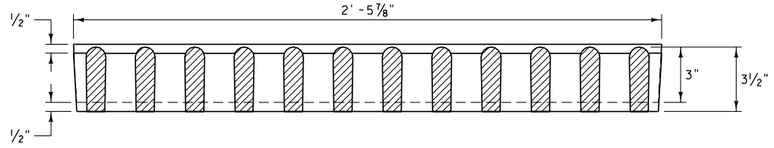
NOTE:
INCLUDE CONCRETE COLLAR
WHEN SPECIFIED.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 552.603	DWG. NO. 603-30
VEHICULAR UNDERPASS AND BACKFILL RETAINER & CUTOFF WALL DETAIL	
--REVISED-- January 2008	EFFECTIVE: FEBRUARY 2005
	MONTANA DEPARTMENT OF TRANSPORTATION (MDT serving you with pride)

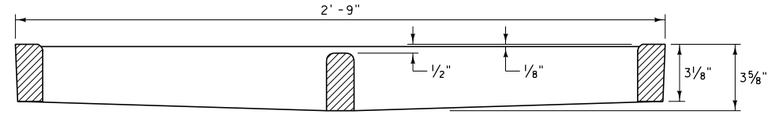


PLAN

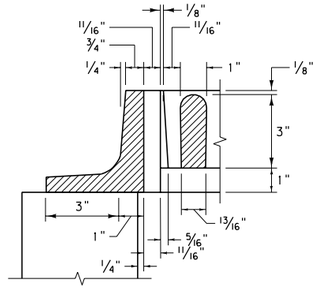
NOTE: INSTALL GRATE WITH BARS PERPENDICULAR TO INTAKE FLOW



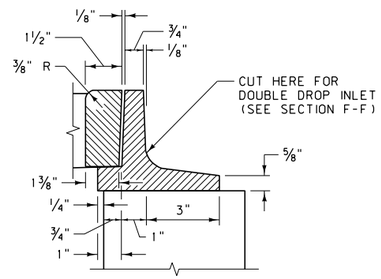
SECTION A-A
GRATE



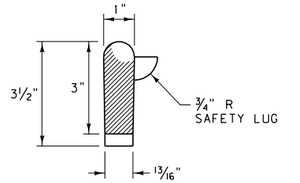
SECTION B-B
GRATE



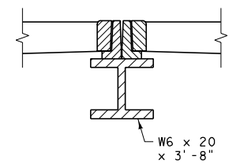
SECTION C-C



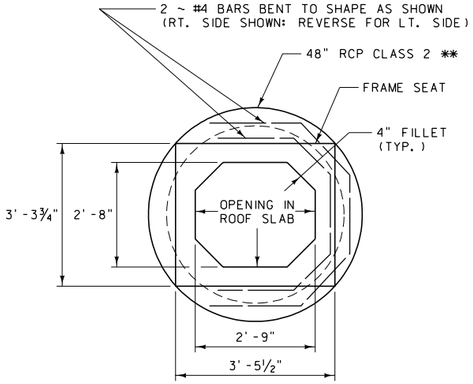
SECTION D-D

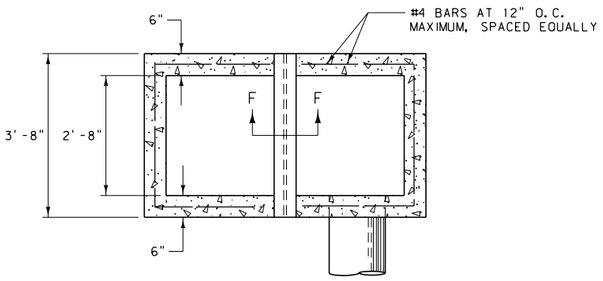


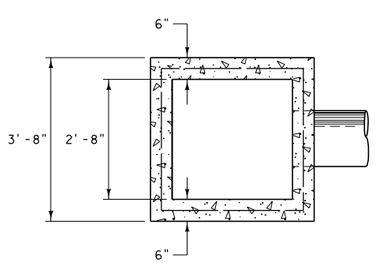
SECTION E-E



SECTION F-F
(FOR DOUBLE INLET)

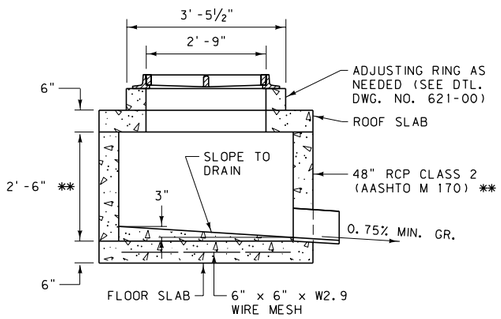




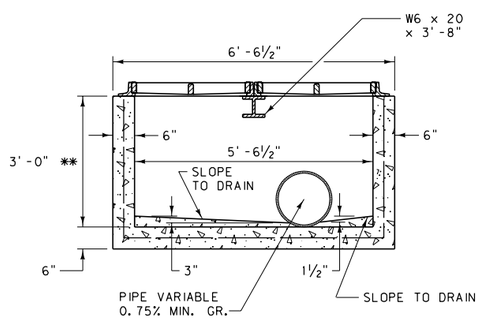


QUANTITIES *		
	CONCRETE	REINF. STL.
TYPE I	0.45 C.Y.	40 LB.
TYPE II	1.5 C.Y.	145 LB.
TYPE III	1.0 C.Y.	90 LB.

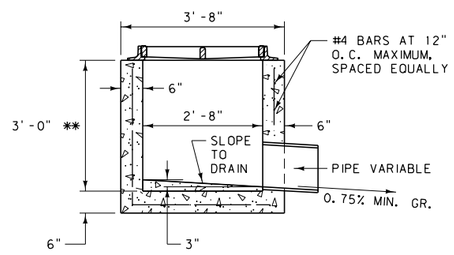
* FOR ESTIMATING PURPOSES ONLY



ROUND, SINGLE DROP INLET
TYPE I



DOUBLE DROP INLET
TYPE II



SINGLE DROP INLET
TYPE III

NOTES:

USE TYPE I, TYPE II AND TYPE III DROP INLETS IN SAG LOCATIONS ONLY.

ALL CONCRETE IS CLASS "DD" OR APPROVED EQUAL.

SEE PLANS FOR DETAILS AND QUANTITIES.

** STANDARD UNLESS OTHERWISE NOTED ON PLANS.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 604

DWG. NO. 604-14

DROP INLETS

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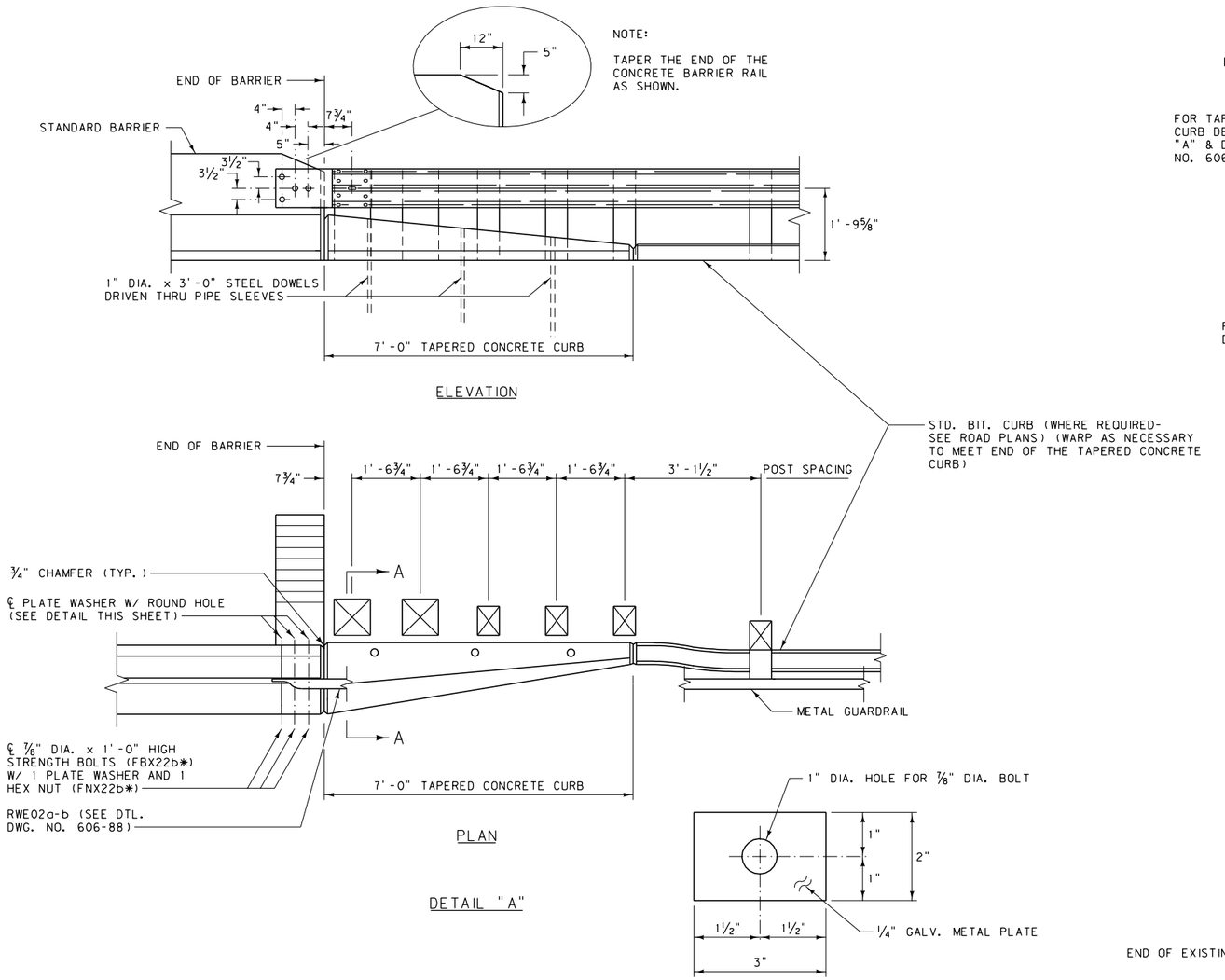
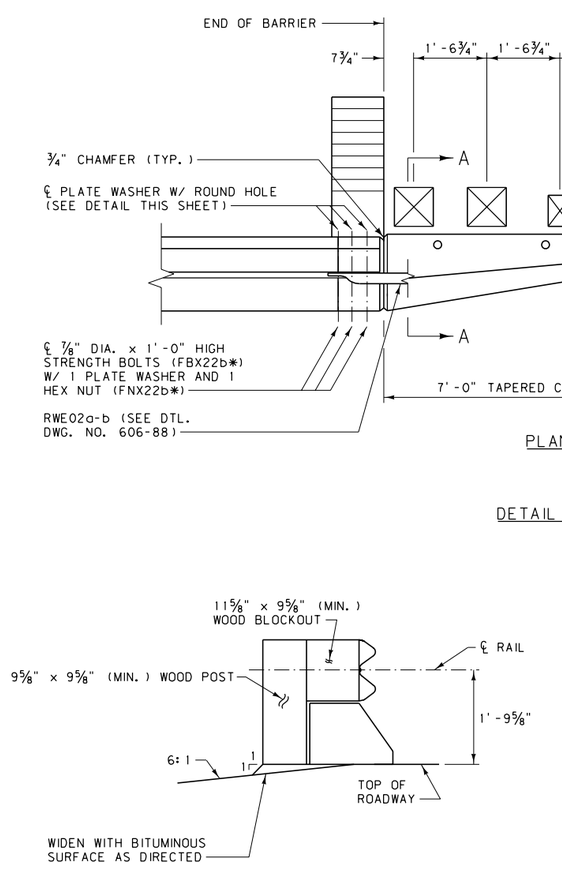




NOTES:

① TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27

② TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.

③ PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.

④ LAP GUARDRAIL IN THE DIRECTON OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05A).

⑤ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.

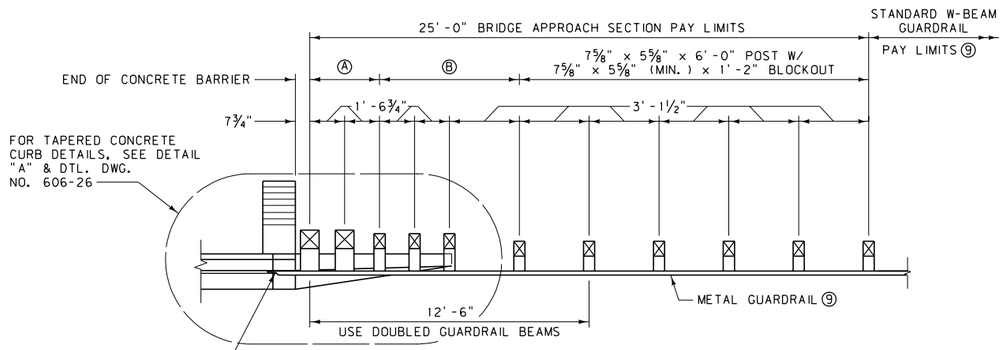
⑥ USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.

⑦ DO NOT FLARE BRIDGE APPROACH SECTIONS.

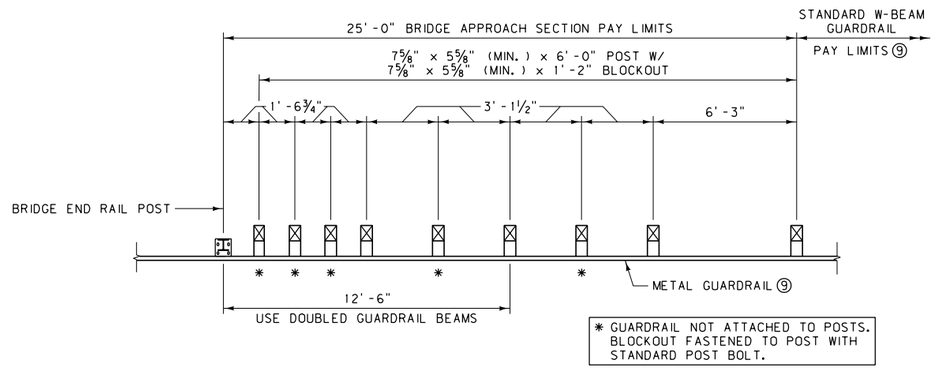
⑧ SEE DTL. DWG. NO. 606-25A FOR SKEWED BRIDGES.

⑨ SEE DTL. DWG. NO. 606-05A FOR METAL GUARDRAIL (W-BEAM).

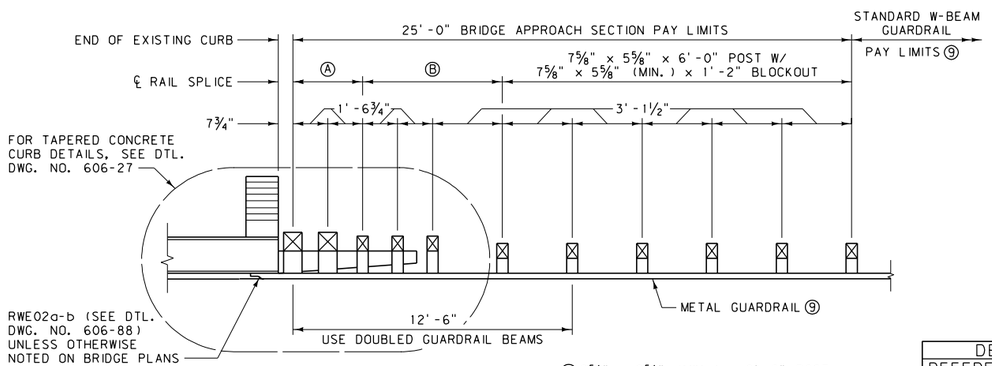
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR BRIDGES USING CONCRETE BARRIER RAIL)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2
(FOR BRIDGES WITHOUT CURBS)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-24A

BRIDGE APPROACH SECTIONS - WOOD POSTS

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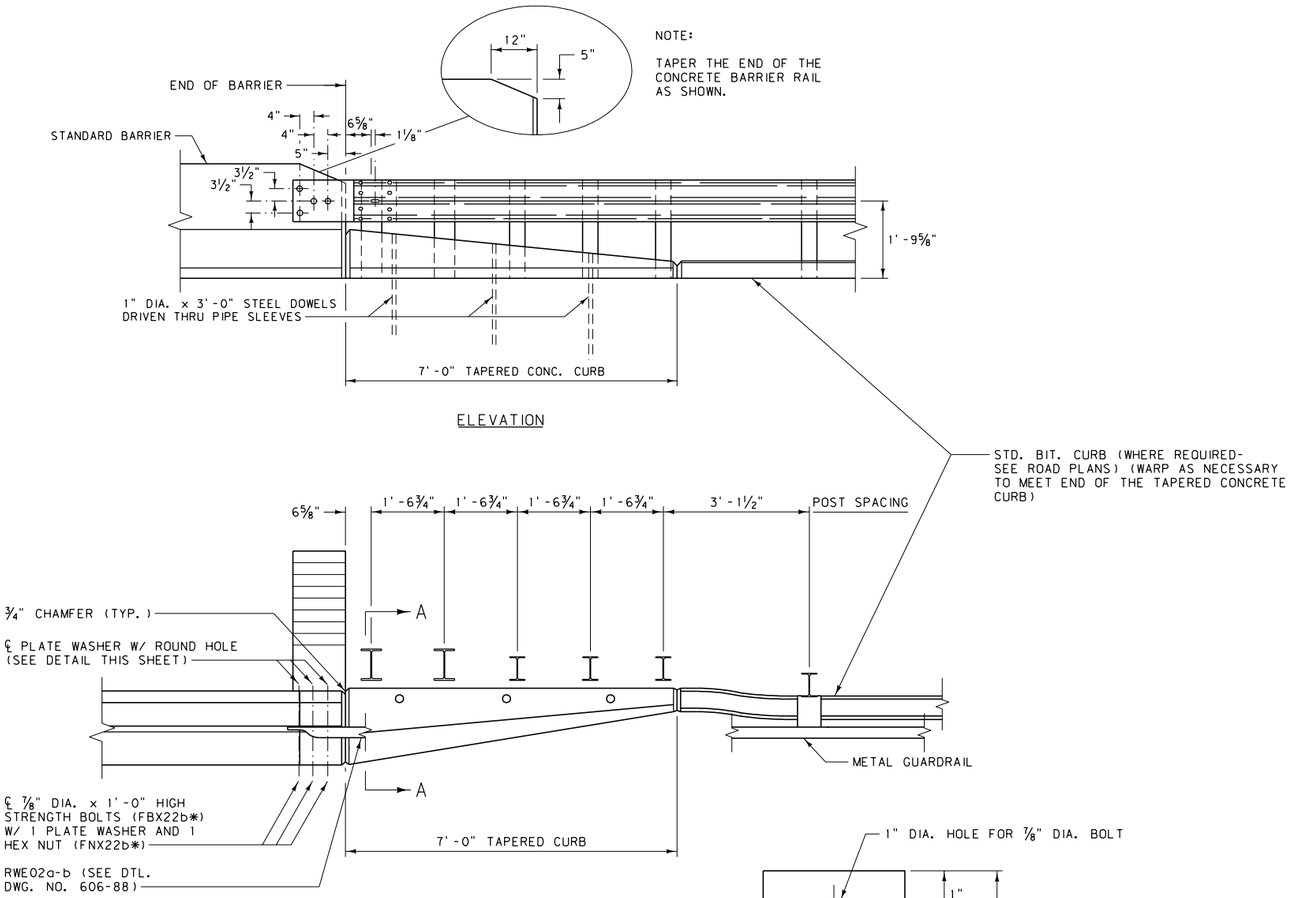


ELEVATION

PLAN

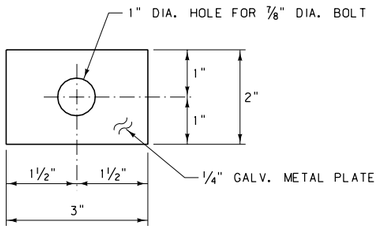
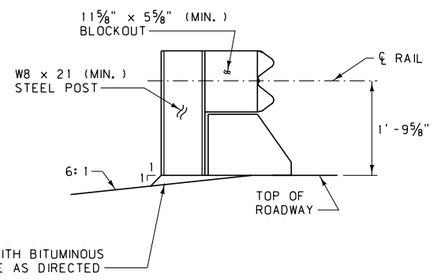


PLATE WASHER

DETAIL "A"



SECTION A-A

NOTES:

① TAPERED CONCRETE CURBS:
TYPE 1, SEE DTL. DWG. NO. 606-26
TYPE 3, SEE DTL. DWG. NO. 606-27

② TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.

③ PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.

④ LAP GUARDRAIL IN THE DIRECTON OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05B).

⑤ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.

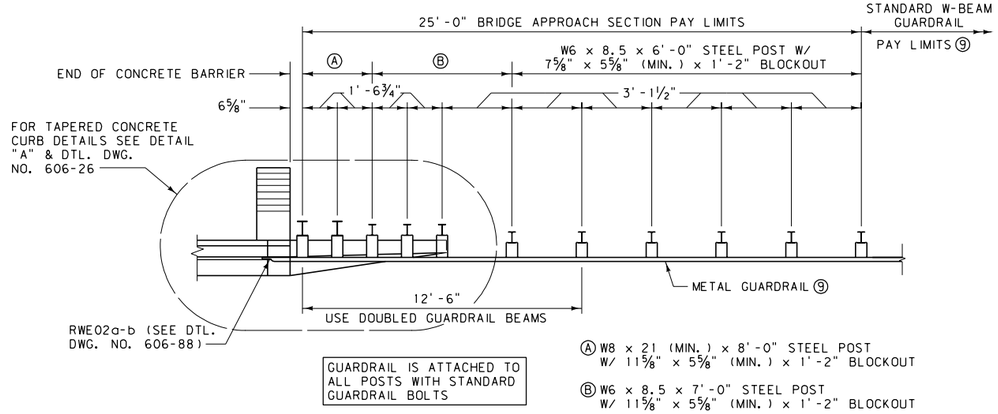
⑥ USE ROUTED WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.

⑦ DO NOT FLARE BRIDGE APPROACH SECTIONS.

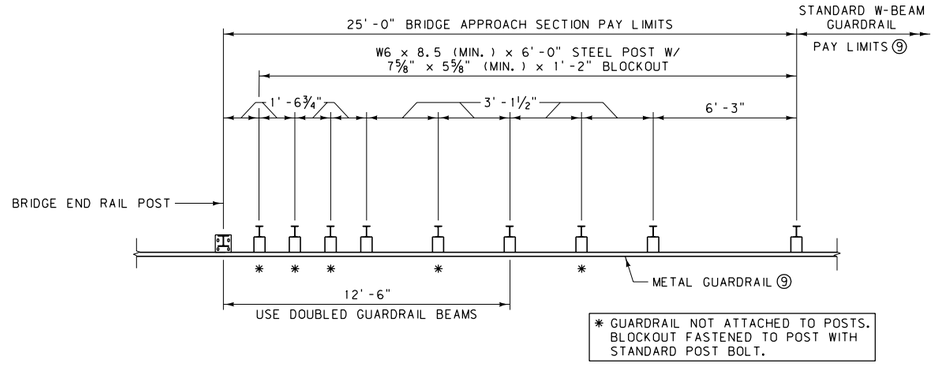
⑧ SEE DTL. DWG. NO. 606-25B FOR SKEWED BRIDGES.

⑨ SEE DTL. DWG. NO. 606-05B FOR METAL GUARDRAIL (W-BEAM).

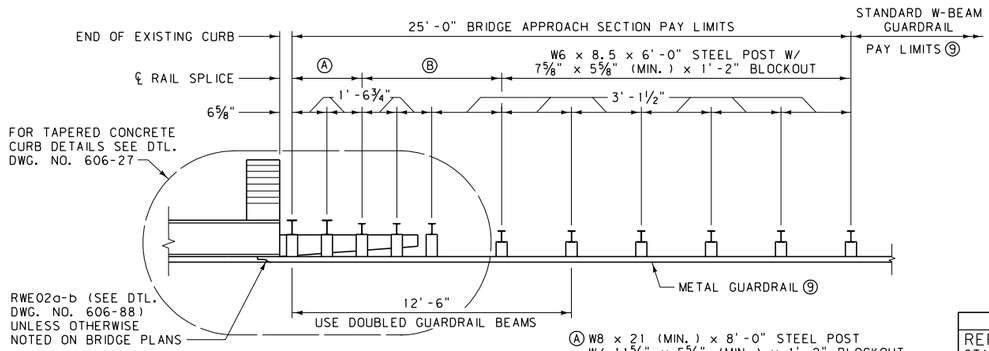
* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1
(FOR BRIDGES USING CONCRETE BARRIER RAIL)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2
(FOR BRIDGES WITHOUT CURBS)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-24B

BRIDGE APPROACH SECTIONS - STEEL POSTS

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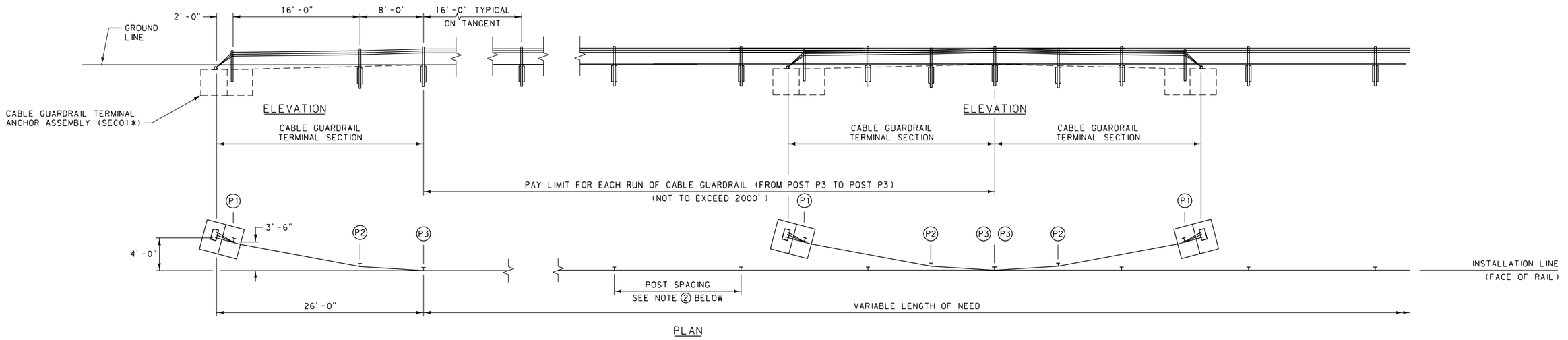
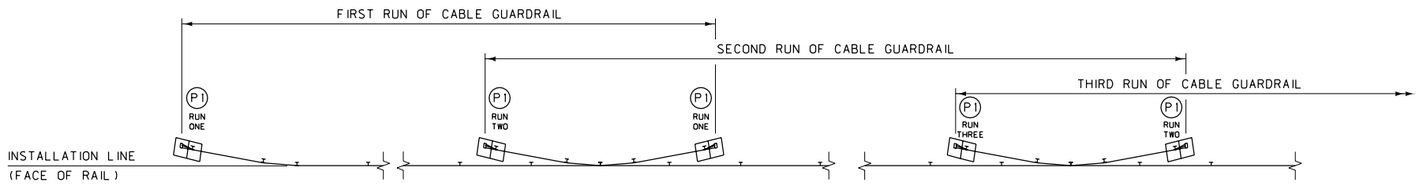
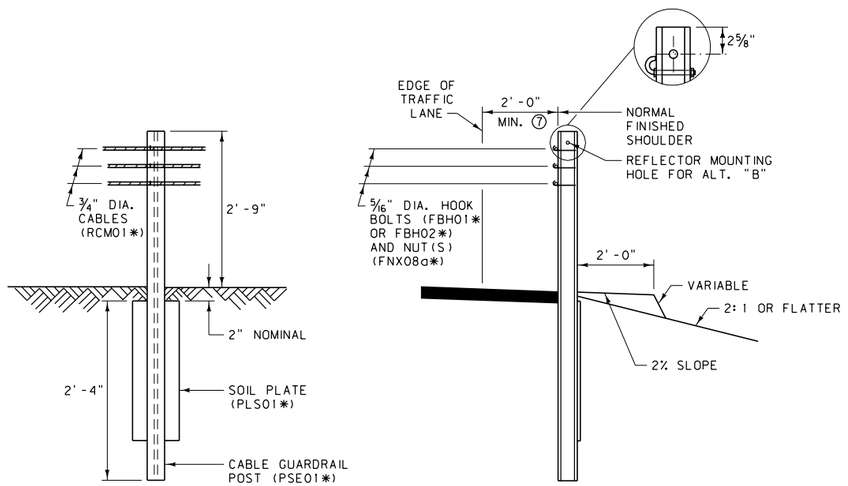




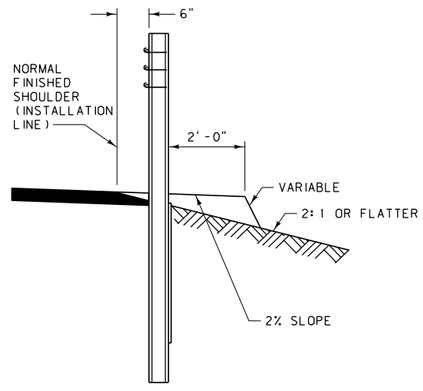
TYPICAL LAYOUT FOR MULTIPLE RUNS OF CABLE GUARDRAIL

EACH RUN OF CABLE GUARDRAIL CONTAINS TWO TERMINAL SECTIONS WITH ANCHOR ASSEMBLIES.



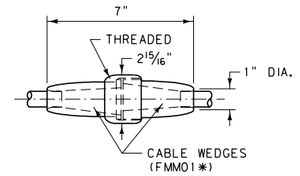
TYPICAL INSTALLATION DETAIL

LINE POST & POST P3



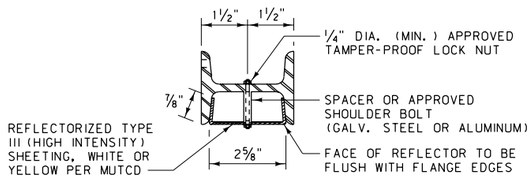
TYPICAL INSTALLATION DETAIL

POST P2

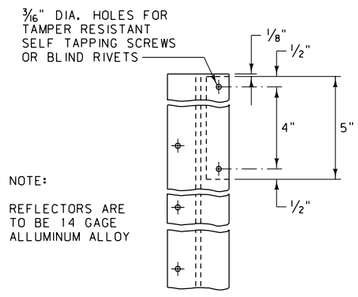


CABLE SPLICE

SPLICE CABLE USING A COUPLING DEVICE AS SHOWN, OR AN ALTERNATE METHOD APPROVED BY THE ENGINEEER.



REFLECTOR ALT. "B"



REFLECTOR ALT. "A"

NOTES:

① FOR CABLE GUARDRAIL RUNS OF:

1044 FEET OR LESS: USE COMPENSATING CABLE END ASSEMBLY (RCE01*) ON ONE END AND TURNBUCKLE CABLE END ASSEMBLY * ON THE OTHER END OF EACH CABLE.

GREATER THAN 1044 FEET, UP TO 2052 FEET MAXIMUM: USE COMPENSATING CABLE END ASSEMBLY (RCE01*) ON BOTH ENDS OF EACH CABLE.

② LINE POST SPACING:

TANGENTS AND CURVES WITH RADII 700 FT AND GREATER: 16 FEET.

CURVES WITH RADII LESS THAN 700 FT DOWN TO 440 FT: 12 FEET.

NOTE: DO NOT INSTALL CABLE GUARDRAIL ON THE INSIDE SHOULDER OF ANY CURVE.

③ UNIFORMLY TENSION ALL CABLES TO COMPRESS SPRINGS BY 3½".

④ DO NOT INSTALL CABLE GUARDRAIL FOR OBSTACLES WITHIN 12 FEET OF THE INSTALLATION LINE.

⑤ DO NOT USE CABLE GUARDRAIL WITH FILL SLOPES STEEPER THAN 2:1, UNLESS THE DISTANCE BETWEEN THE BACK OF THE POSTS AND THE BREAK IN THE FILL SLOPE IS AT LEAST 8 FEET.

⑥ ATTACH REFLECTORS TO EVERY OTHER LINE POST (32 FEET TYP.), BEGINNING AT POST P3. DO NOT ATTACH REFLECTORS TO POSTS P1 AND P2.

⑦ WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-40

CABLE GUARDRAIL

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EFFECTIVE: FEBRUARY 2005

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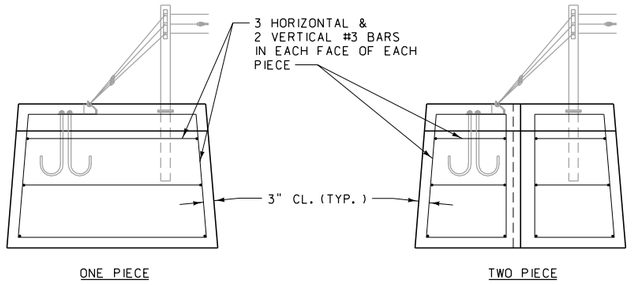
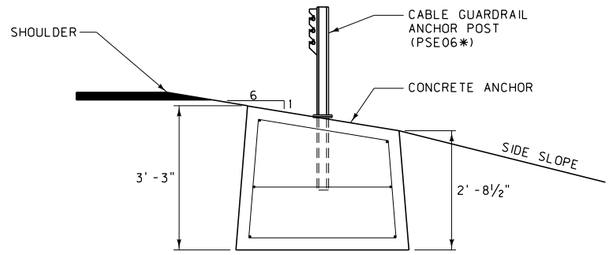
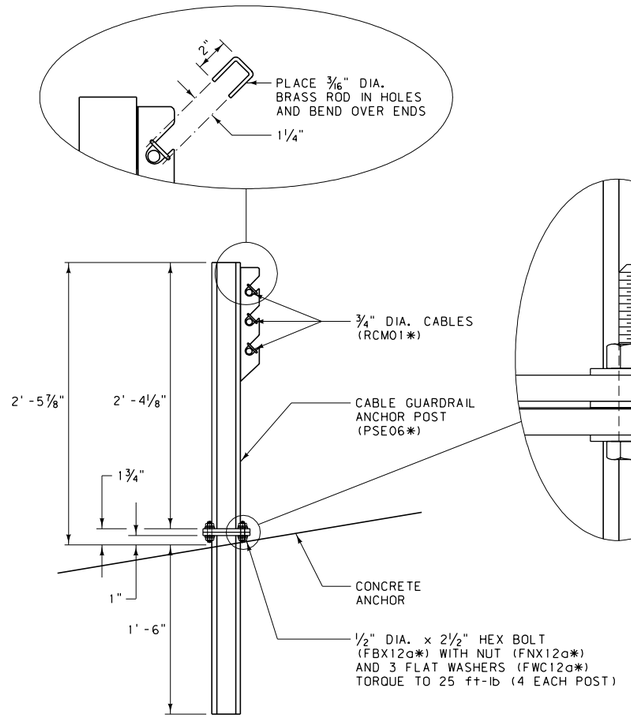
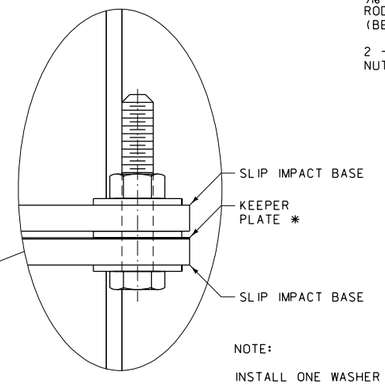




ANCHOR UNIT & RE-BAR INSTALLATION DETAILS

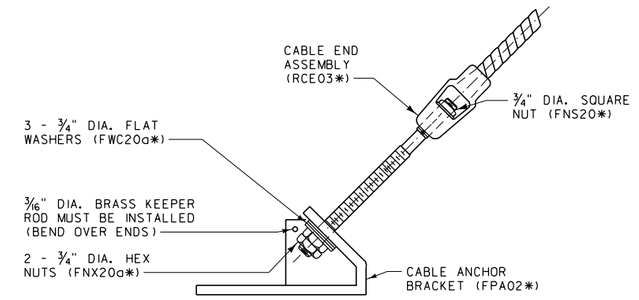


ANCHOR POST DETAIL



NOTE:

INSTALL ONE WASHER UNDER HEAD, ONE BETWEEN PLATES & ONE UNDER NUT. AN ADDITIONAL WASHER MAY BE PLACED BETWEEN PLATES TO PLUMB THE ANCHOR POST.



CABLE END ASSEMBLY TO ANCHOR BRACKET DETAIL

NOTES:

① INSTALL THE CONCRETE ANCHOR INTO THE EXCAVATION, AS DETAILED, SO THAT THE BOTTOM OF THE ANCHOR HAS A FULL AND EVEN BEARING ON THE SURFACE UNDER IT. BACKFILL AROUND THE CONCRETE ANCHOR IN ACCORDANCE WITH SECTION 203.03.3 OF THE STANDARD SPECIFICATIONS.

② THE CONCRETE ANCHOR CAN BE PLACED AS ONE OR TWO PIECES. THIS DETAIL PRIMARILY SHOWS A TWO PIECE INSTALLATION. FOR ONE PIECE INSTALLATIONS, USE ALL THE SAME DIMENSIONS, LESS THE TAPERED KEYWAY AND THE ADDITIONAL REBAR, AS SHOWN.

③ IF LIFTING DEVICES ARE EMBEDDED INTO THE CONCRETE ANCHORS, INSURE THAT THEY HAVE A SAFE WORKING LOAD OF 4 TONS FOR THE ONE PIECE ANCHOR AND 2 TONS EACH FOR EACH OF THE HALVES OF THE TWO PIECE ANCHOR UNIT.

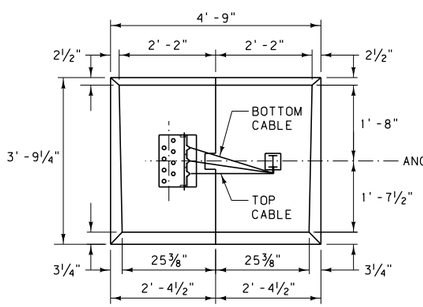
④ USE CLASS "DD" CONCRETE TO CONSTRUCT ANCHOR.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

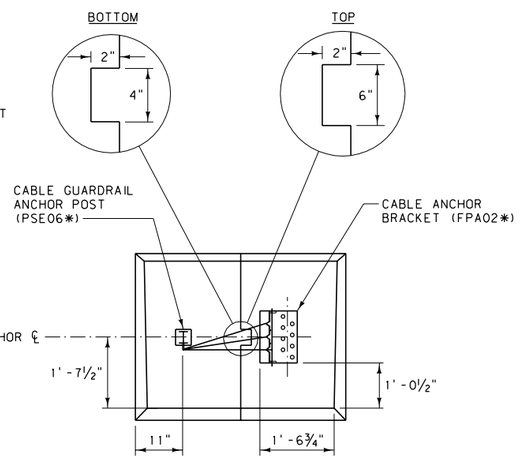
TAPERED KEYWAY DETAIL
(TWO PIECE INSTALLATION)

NOTE:

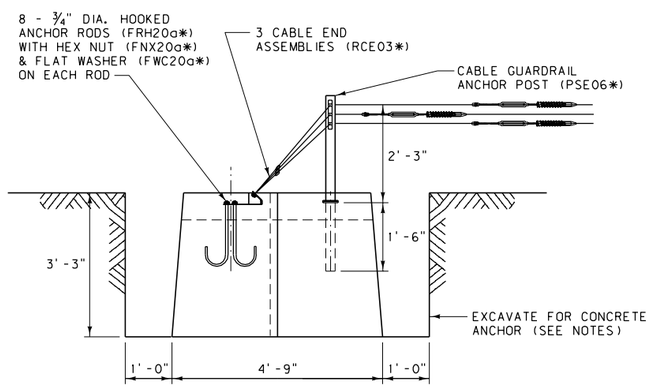
DIMENSIONS FOR LEFT AND RIGHT HAND ANCHOR UNITS ARE THE SAME, WITH THE POSITION OF THE ANCHOR POST AND ANCHOR BRACKET BEING THE ONLY DIFFERENCE.



PLAN
(LEFT HAND ANCHOR UNIT)



PLAN
(RIGHT HAND ANCHOR UNIT)



ELEVATION
(LEFT HAND ANCHOR UNIT)

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-41

CABLE GUARDRAIL TERMINAL ANCHOR ASSEMBLY

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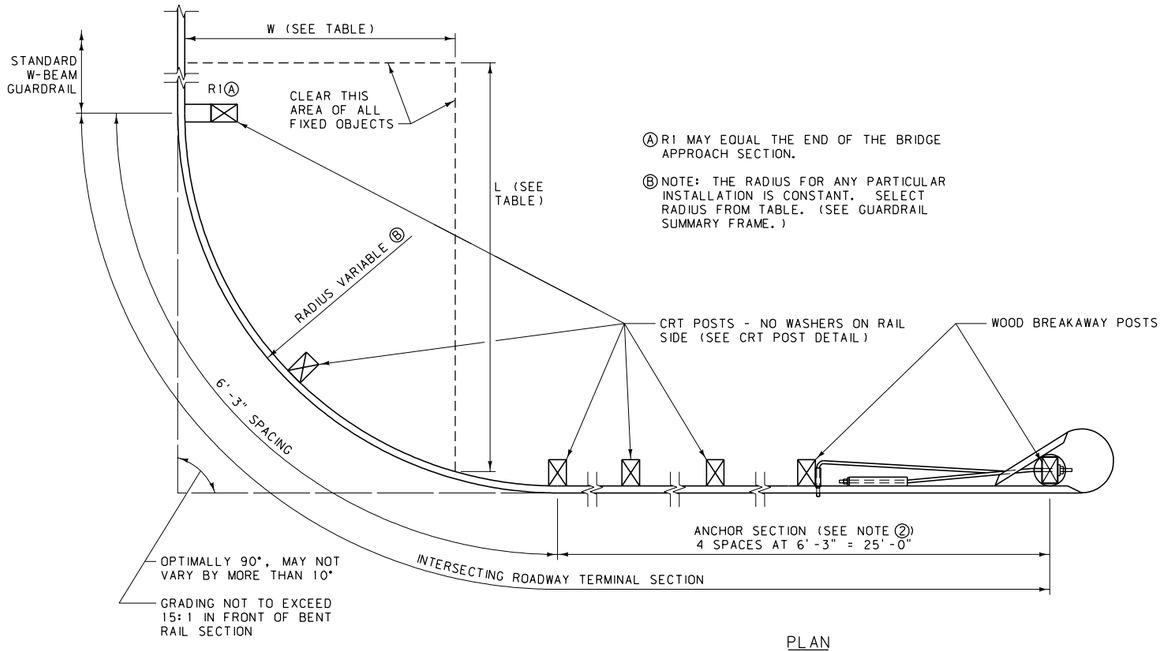
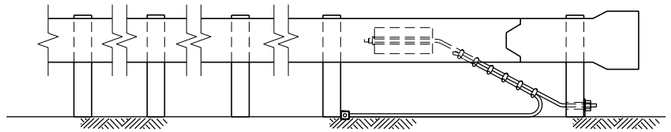


Ⓐ R1 MAY EQUAL THE END OF THE BRIDGE APPROACH SECTION.

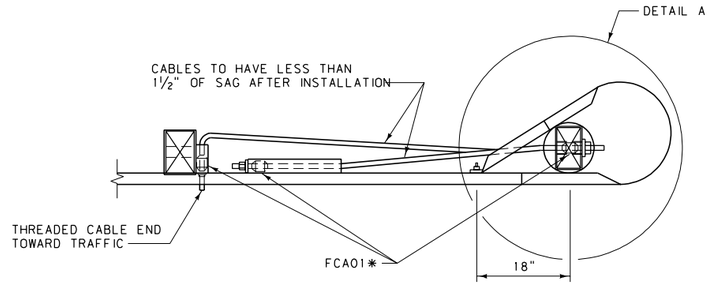
Ⓑ NOTE: THE RADIUS FOR ANY PARTICULAR INSTALLATION IS CONSTANT. SELECT RADIUS FROM TABLE. (SEE GUARDRAIL SUMMARY FRAME.)

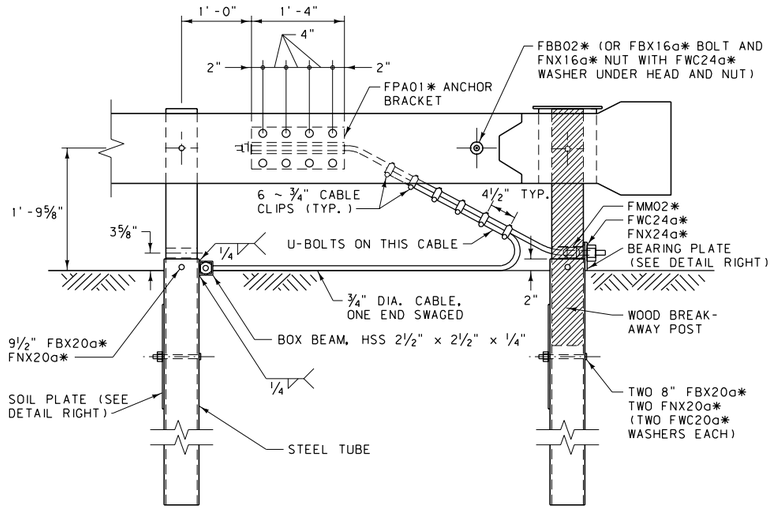
PLAN

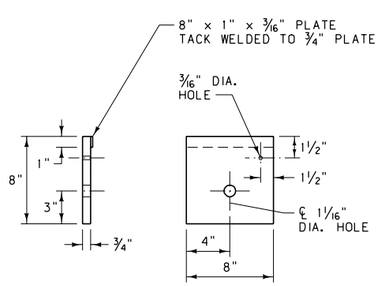
RADIUS TABLE			
RADIUS	LENGTH OF BENT RAIL	L	W
8'	12.5'	25'	15'
16'	25.0'	30'	15'
24'	37.5'	40'	20'
32'	50.0'	50'	20'



ELEVATION

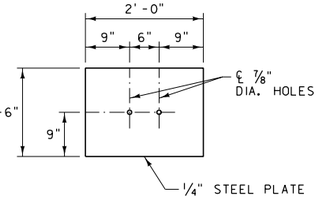






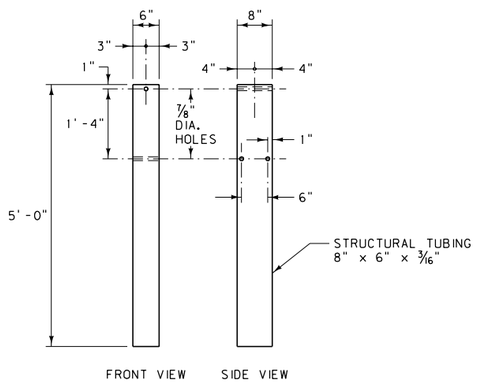
BEARING PLATE DETAIL

FPB01∗



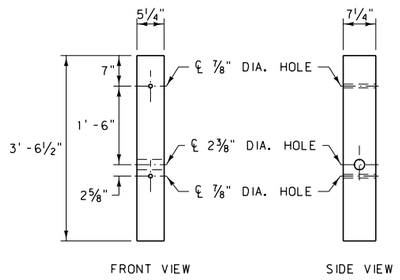
SOIL PLATE DETAIL

PLS03∗



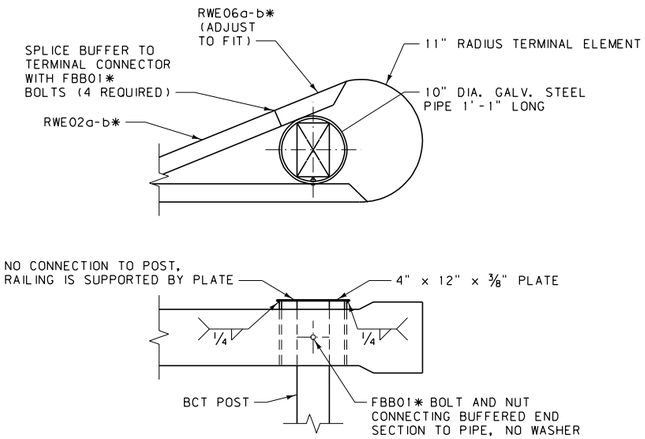
STEEL TUBE DETAILS

PTE05∗

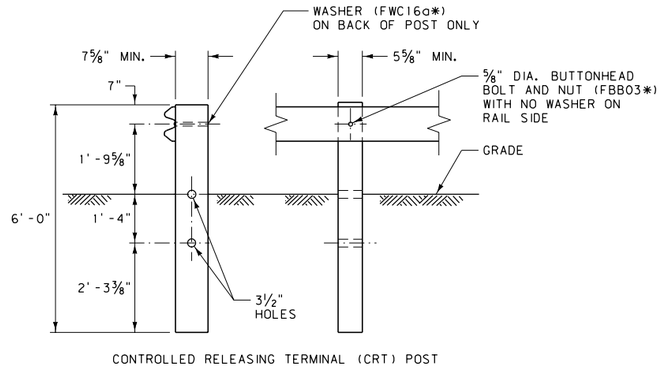


WOOD BREAKAWAY POST DETAILS

PDF01∗



DETAIL A



CONTROLLED RELEASING TERMINAL (CRT) POST

CRT POST DETAIL

PDE09∗

NOTES:

① DO NOT INSTALL ON SLOPES STEEPER THAN 2:1.

② DO NOT OMIT OR SHORTEN ANCHOR SECTION.

③ SEE DTL. DWG. NO. 606-05A FOR GUARDRAIL WIDENING REQUIREMENTS.

∗ SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-46

INTERSECTING ROADWAY TERMINAL SECTION

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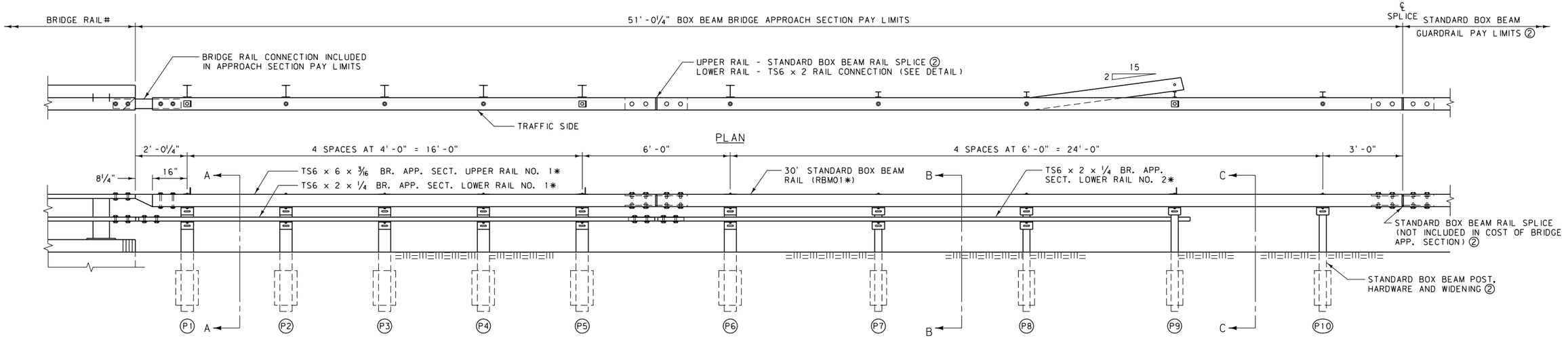
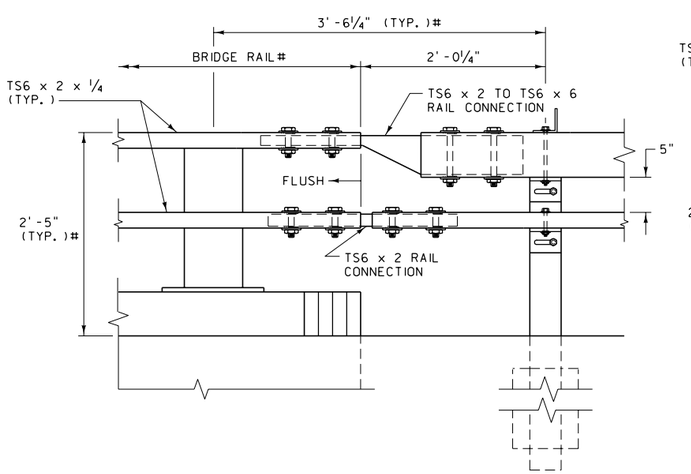
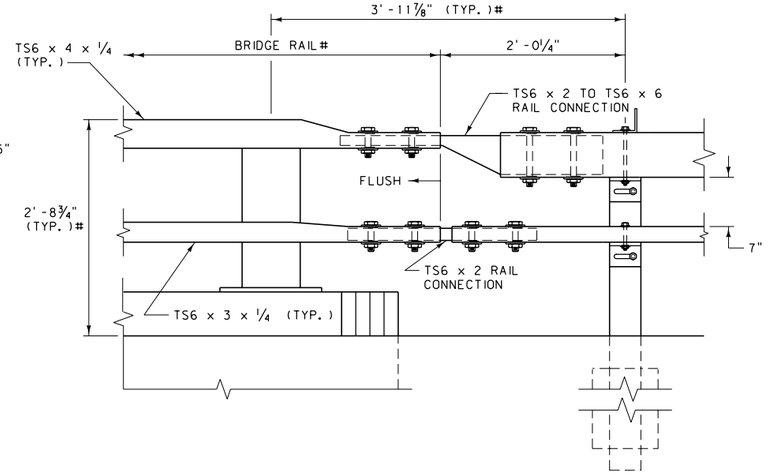
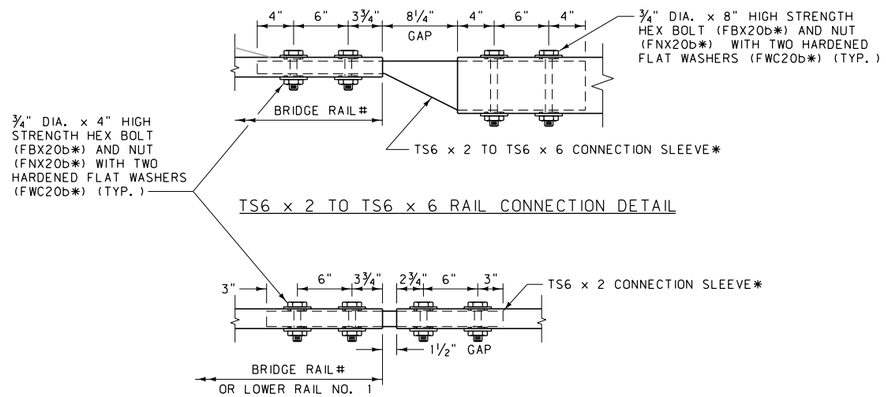




BOX BEAM - BRIDGE APPROACH SECTION TYPE 1

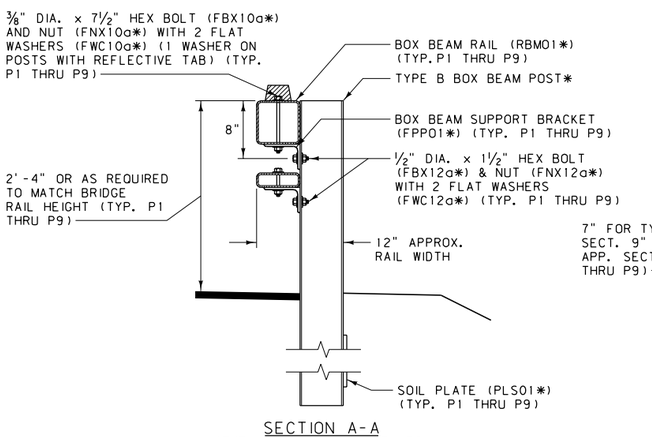


BOX BEAM - BRIDGE APPROACH SECTION TYPE 2

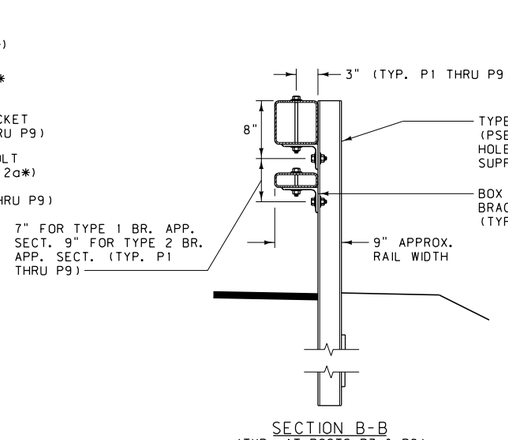


TS6 x 2 TO TS6 x 6 RAIL CONNECTION DETAIL

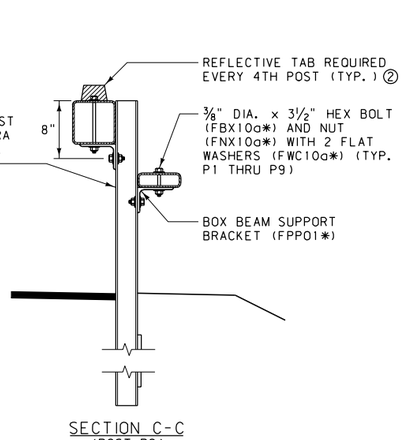
TS6 x 2 RAIL CONNECTION DETAIL



SECTION A-A
(TYP. AT POSTS P1 THRU P6)



SECTION B-B
(TYP. AT POSTS P7 & P8)



SECTION C-C
(POST P9)

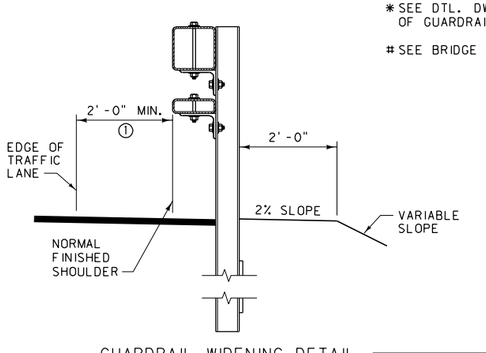
NOTES:

① WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.

② SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

SEE BRIDGE PLANS.



GUARDRAIL WIDENING DETAIL
(TYP AT POST P1 THRU P9)

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-53

BOX BEAM BRIDGE APPROACH SECTION - TYPES 1 & 2

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January 2008

EFFECTIVE: FEBRUARY 2005

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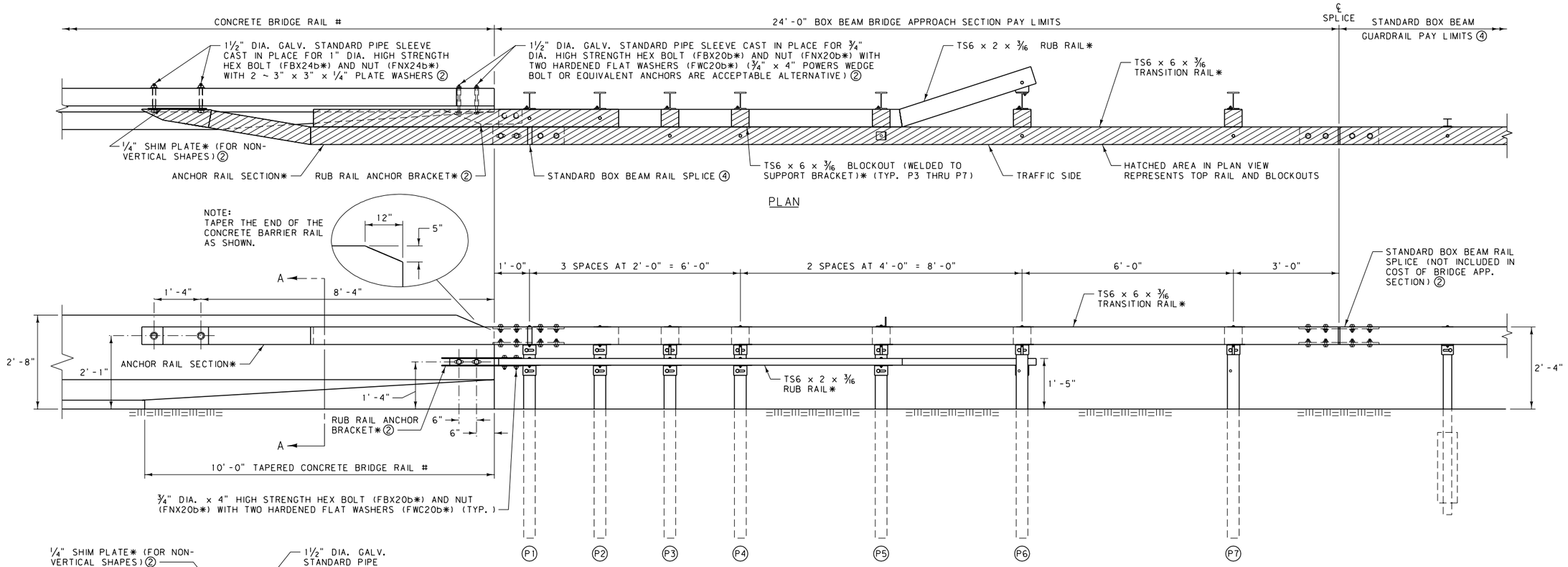
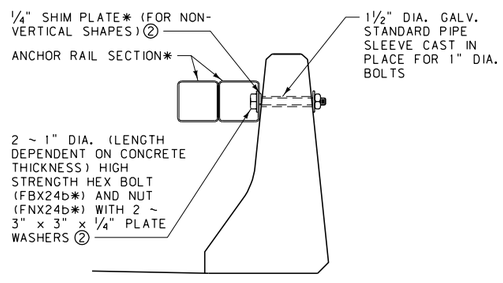
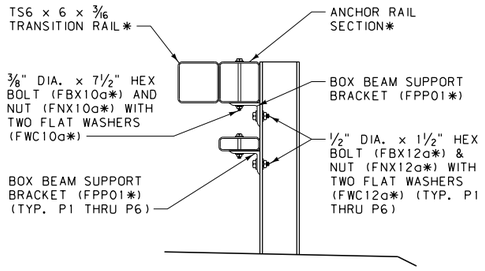
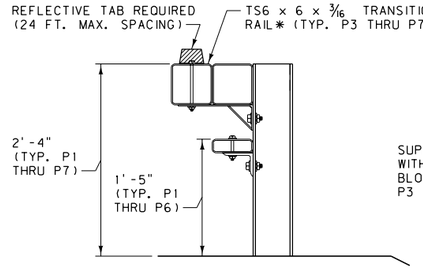




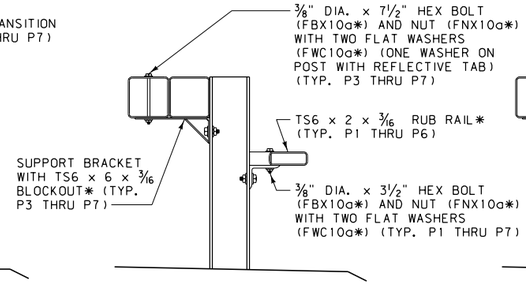
SECTION A-A



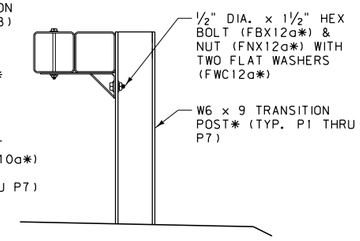
TYP. AT POSTS P1 & P2



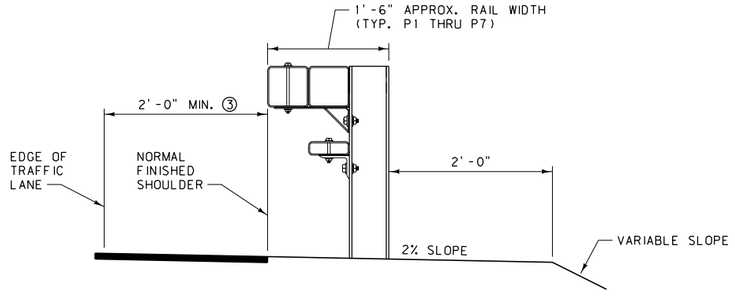
TYP. AT POSTS P3 THRU P5



POST P6



POST P7



GUARDRAIL WIDENING DETAIL

NOTES:

① INCLUDE COST OF ENTIRE ANCHOR RAIL SECTION, ALONG WITH ALL HARDWARE NECESSARY FOR ATTACHMENT TO CONCRETE BRIDGE RAIL, IN COST OF BRIDGE APPROACH SECTION.

② THE LENGTHS OF CONCRETE ANCHOR BOLTS, TYPE OF RUB RAIL ANCHOR BRACKET AND THE NEED FOR THE ¼" SHIM PLATE IS DEPENDENT UPON THE SHAPE AND THE THICKNESS OF THE CONCRETE BRIDGE RAIL.

③ WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" FROM THE TRAFFIC LANE.

④ SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

SEE BRIDGE PLANS.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-53A

BOX BEAM BRIDGE APPROACH SECTION - TYPE 3

--REVISED--

EFFECTIVE: JANUARY 2008

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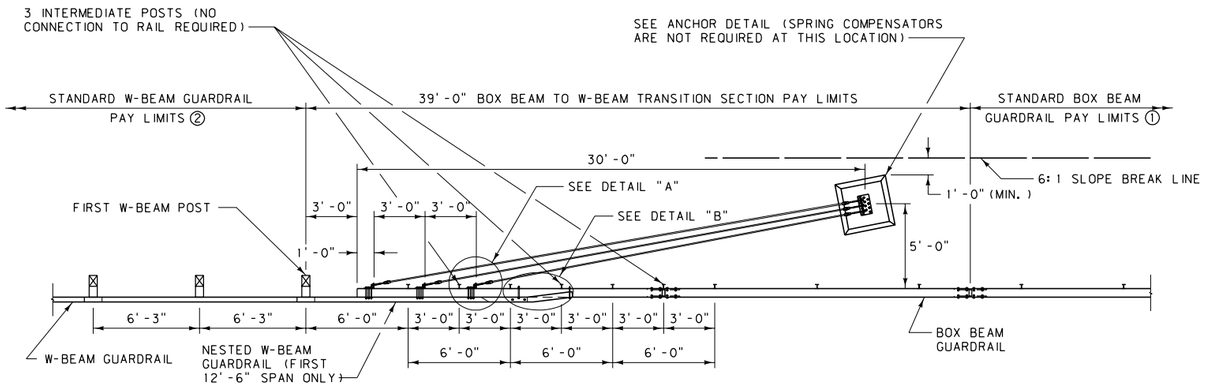
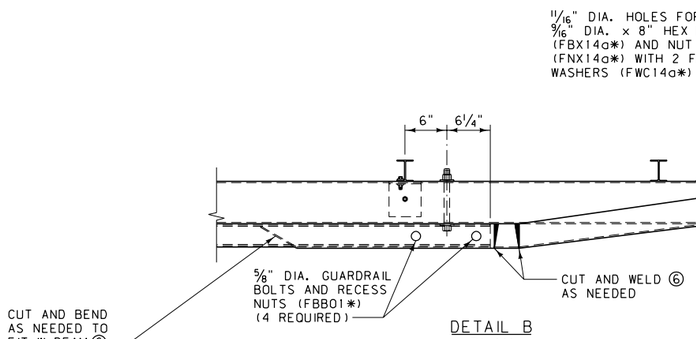


TWO-WAY TRAFFIC

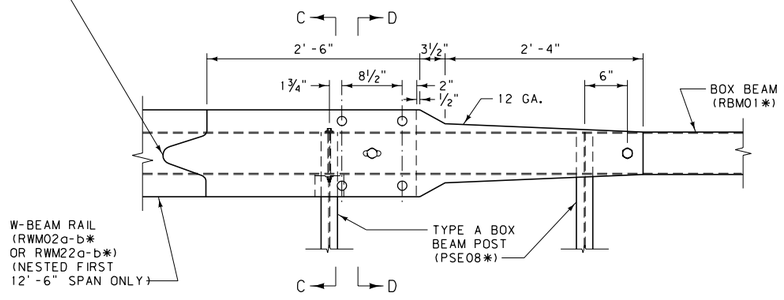
OR ONE-WAY TRAFFIC

OR ONE-WAY TRAFFIC

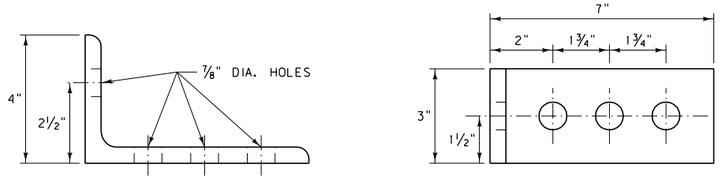
BOX BEAM TO W-BEAM TRANSITION SECTION ③



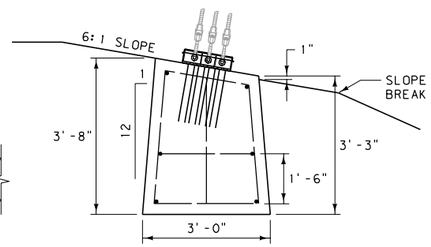
DETAIL B
PLAN



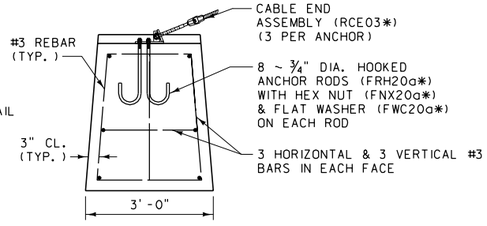
DETAIL B
ELEVATION



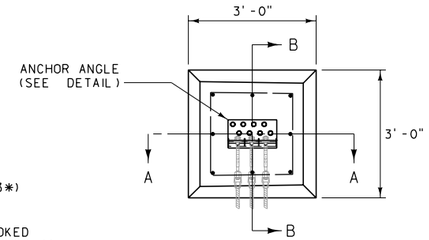
7" x 4" x ½" L
DETAIL



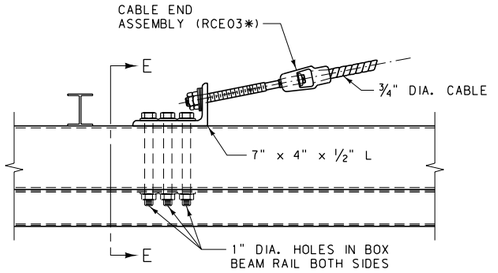
SECTION A-A



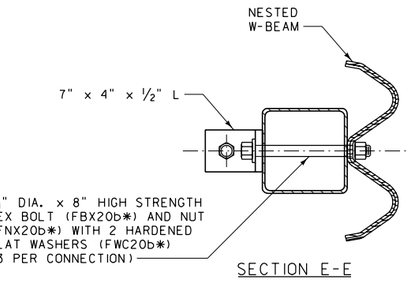
SECTION B-B



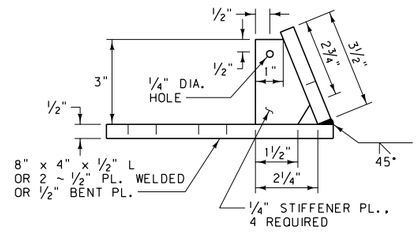
ANCHOR DETAIL ⑤
PLAN



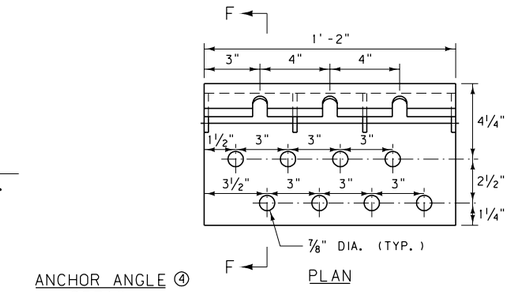
DETAIL A
PLAN



SECTION E-E

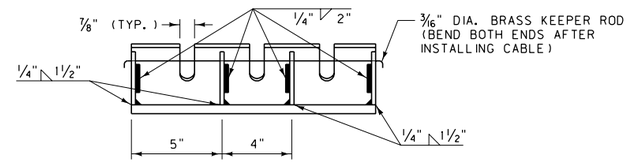


SECTION F-F

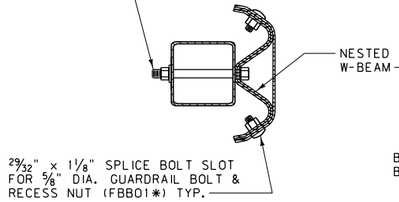


PLAN

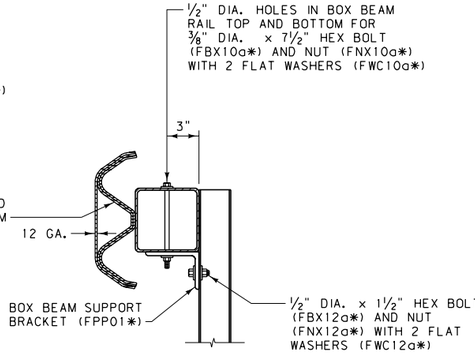
ANCHOR ANGLE ④
DETAIL



ELEVATION



SECTION D-D



SECTION C-C

NOTES:

① SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

② SEE DTL. DWG. NO. 606-05A AND 606-05B FOR STANDARD W-BEAM GUARDRAIL AND ASSOCIATED DETAILS.

③ MANUFACTURE ANCHOR ANGLES USING AASHTO M 270 GRADE 36 STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.

④ GALVANIZE ANCHOR ANGLES IN ACCORDANCE WITH AASHTO M 111. NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

⑤ USE CLASS "DD" CONCRETE TO CONSTRUCT ANCHOR.

⑥ ANY HOLES, CUTS, SLOTS OR WELDS MADE ON THE W-BEAM OR BOX BEAM RAIL AFTER GALVINIZING IS TO BE PAINTED WITH AN APPROVED GALVANIZING PAINT.

⑦ LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-58

BOX BEAM TO W-BEAM TRANSITION SECTION

--REVISED-- January 2008

EFFECTIVE: FEBRUARY 2005

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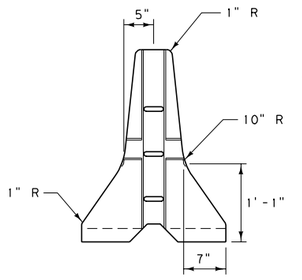
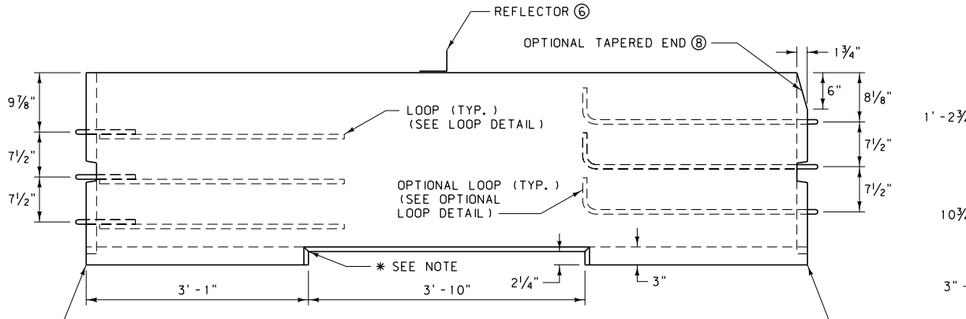
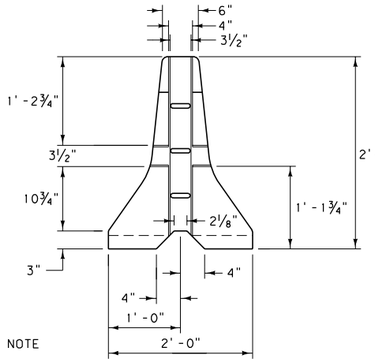


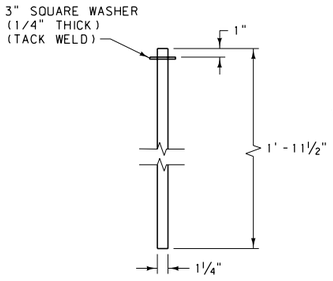
END VIEW



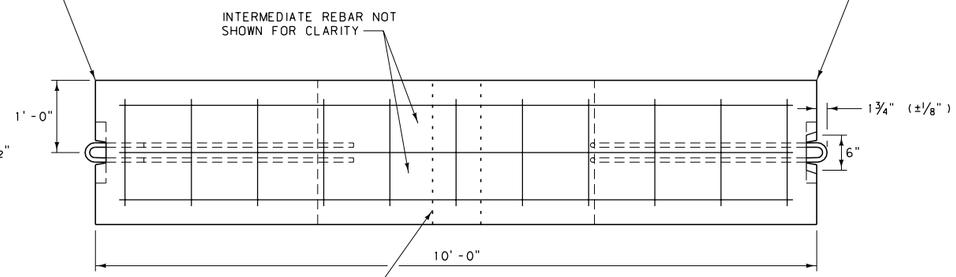
ELEVATION VIEW



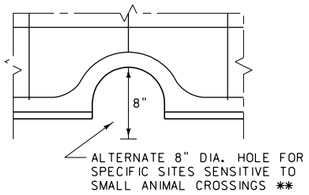
END VIEW



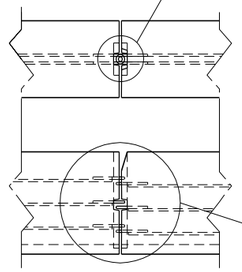
CONNECTING PIN DETAIL

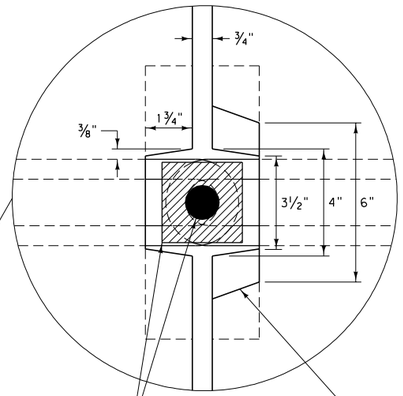


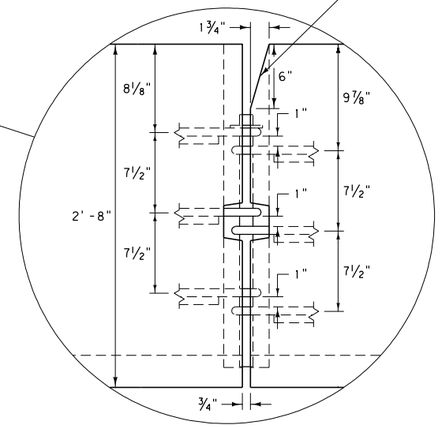
PLAN VIEW

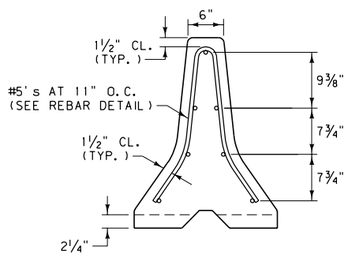


ALTERNATE CONCRETE BARRIER
RAIL DETAIL









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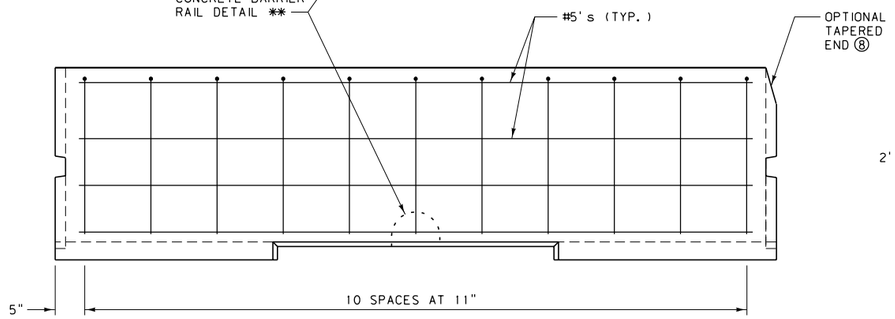
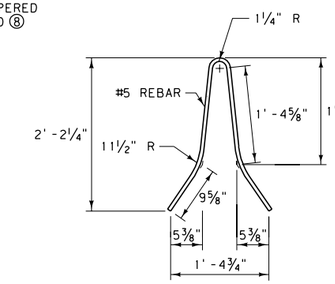
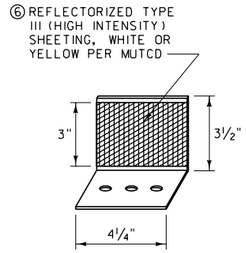


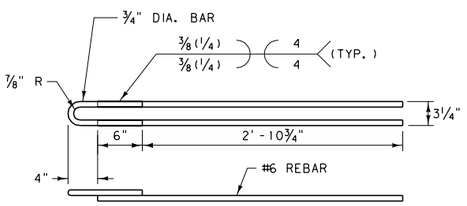
ELEVATION VIEW



REBAR DETAIL



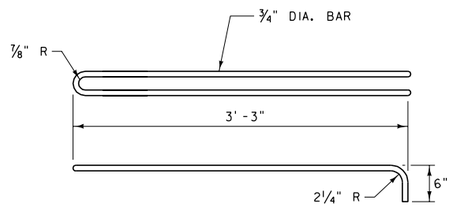
REFLECTOR
(SEE NOTES)



LOOP DETAIL

LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING ⅛" DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.



OPTIONAL LOOP DETAIL

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

NOTES:

① USE CLASS "DD" CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31, GRADE 60.

③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270, GRADE 36 OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ ATTACH REFLECTORS TO RAIL EVERY 30'. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.

⑦ DO NOT INSTALL UN-ANCHORED CONCRETE BARRIER RAIL FOR OBSTACLES WITHIN 6.5' OF THE BASE (TRAFFIC SIDE) OF THE RAIL. SEE DTL. DWG. NO. 606-62 FOR CONCRETE BARRIER RAIL ANCHORS.

⑧ THE OPTIONAL TAPERED END SHOWN IS AN ACCEPTABLE ALTERNATE TO THE VERTICAL END FOR ALL CONCRETE BARRIER RAIL ENDS.

* ¾" CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) ½" CHAMFER IS ACCEPTABLE.

** USE THE ALTERNATE 8" DIA. HOLE IN THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 554, 606

DWG. NO. 606-60

CONCRETE BARRIER RAIL

--REVISED--
January 2008

EFFECTIVE: APRIL 2006

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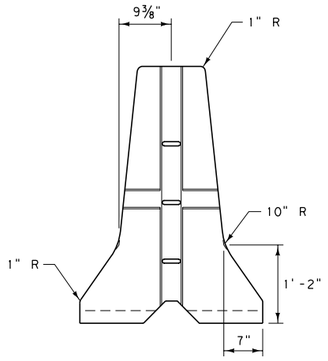
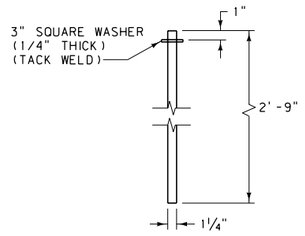
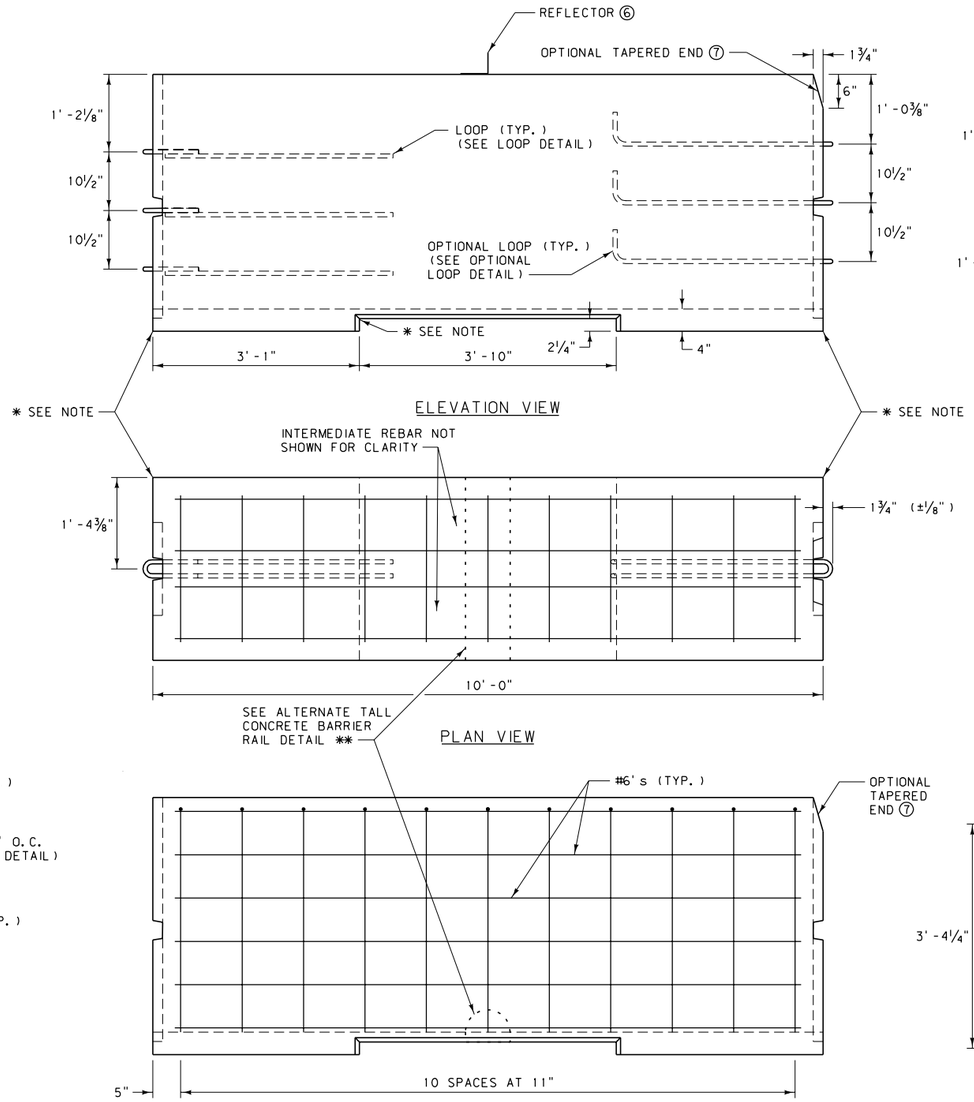
MONTANA DEPARTMENT OF TRANSPORTATION



END VIEW

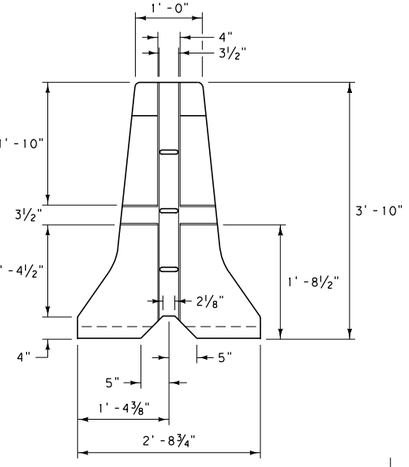


CONNECTING PIN DETAIL

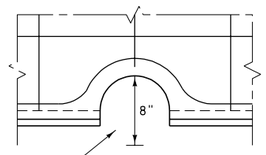


ELEVATION VIEW

PLAN VIEW

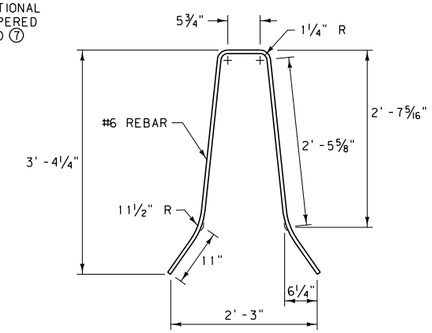


END VIEW

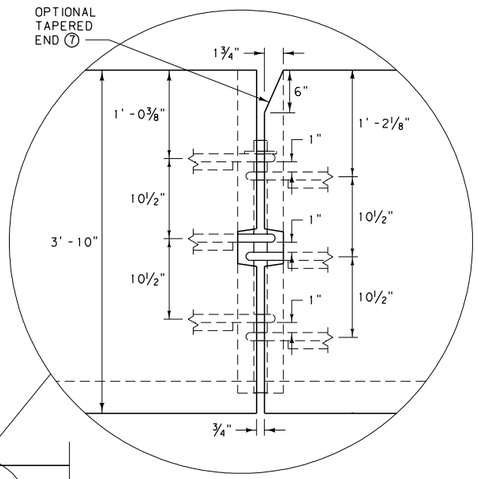


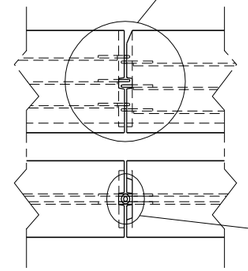
ALTERNATE 8" DIA. HOLE FOR SPECIFIC SITES SENSITIVE TO SMALL ANIMAL CROSSINGS **

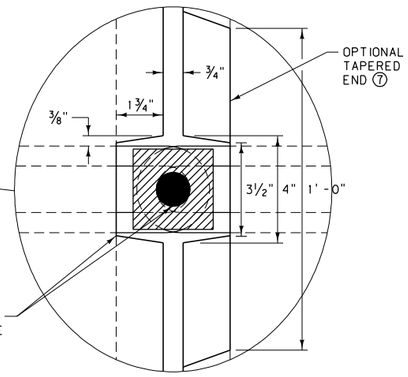
ALTERNATE TALL CONCRETE BARRIER RAIL DETAIL

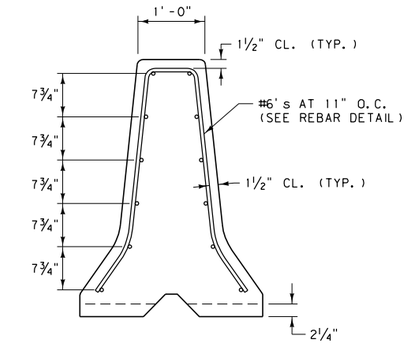


REBAR DETAIL



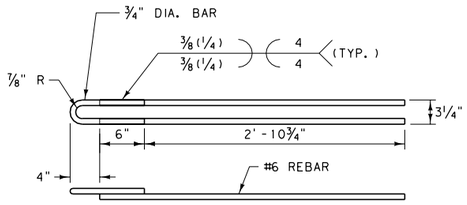






END VIEW

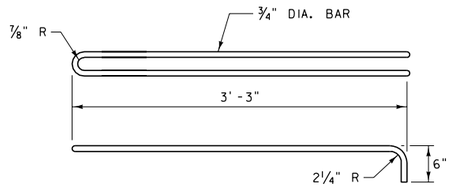
ELEVATION VIEW



LOOP DETAIL

LOOP FABRICATION REQUIREMENTS:

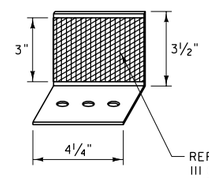
1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING ⅛" DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.



OPTIONAL LOOP DETAIL

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.



REFLECTOR
(SEE NOTES)

REFLECTORIZED TYPE III (HIGH INTENSITY) SHEETING, WHITE OR YELLOW PER MUTCD ⑥

NOTES:

① USE CLASS "DD" CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31, GRADE 60.

③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270, GRADE 36 OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ ATTACH REFLECTORS TO RAIL EVERY 30'. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.

⑦ THE OPTIONAL TAPERED END SHOWN IS AN ACCEPTABLE ALTERNATE TO THE VERTICAL END FOR ALL CONCRETE BARRIER RAIL ENDS.

* ¾" CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) ½" CHAMFER IS ACCEPTABLE.

** USE THE ALTERNATE 8" DIA. HOLE IN THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 554, 606

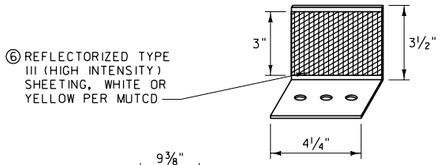
DWG. NO. 606-64

TALL CONCRETE BARRIER RAIL

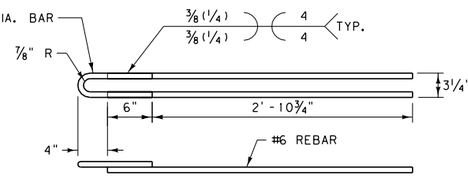
--REVISED--
January 2008

EFFECTIVE: FEBRUARY 2005

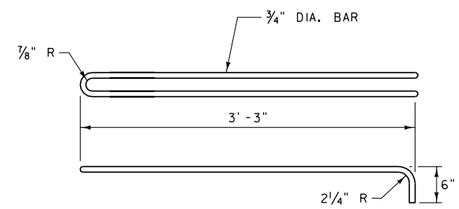
MDT serving you with pride — MONTANA DEPARTMENT OF TRANSPORTATION



REFLECTOR
(SEE NOTES)



LOOP DETAIL



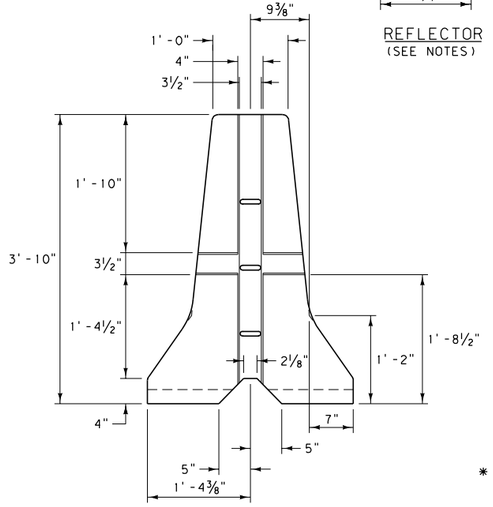
OPTIONAL LOOP DETAIL

LOOP FABRICATION REQUIREMENTS:

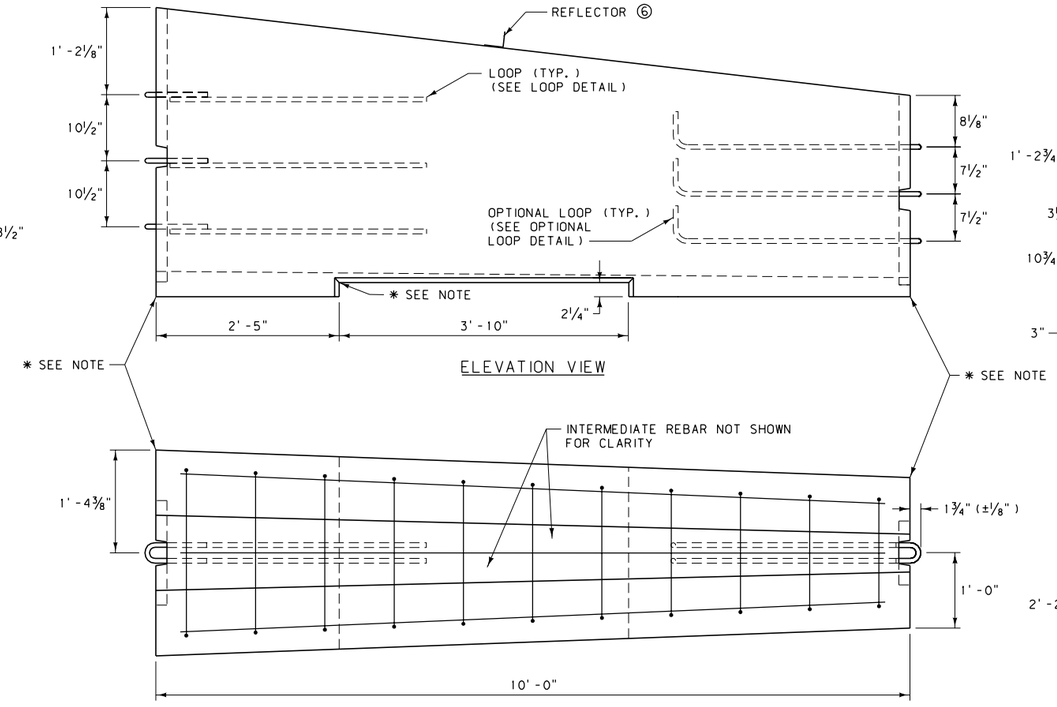
1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING ⅛" DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

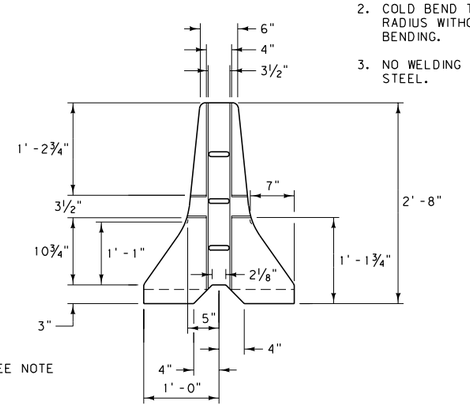


LEFT END VIEW

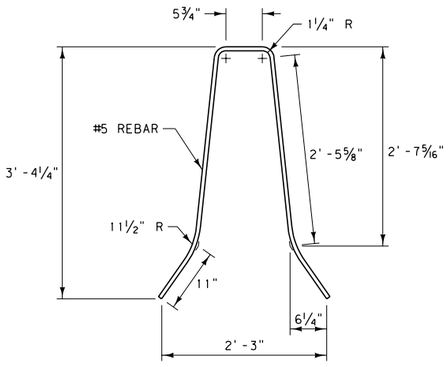


ELEVATION VIEW

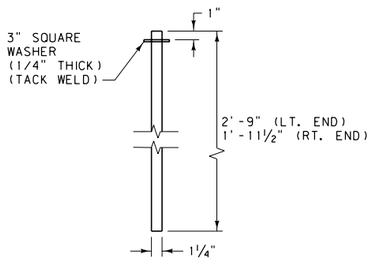
PLAN VIEW



RIGHT END VIEW



REBAR DETAIL LEFT END



CONNECTING PIN DETAIL

NOTES:

① USE CLASS "DD" CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31, GRADE 60.

③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270, GRADE 36 OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

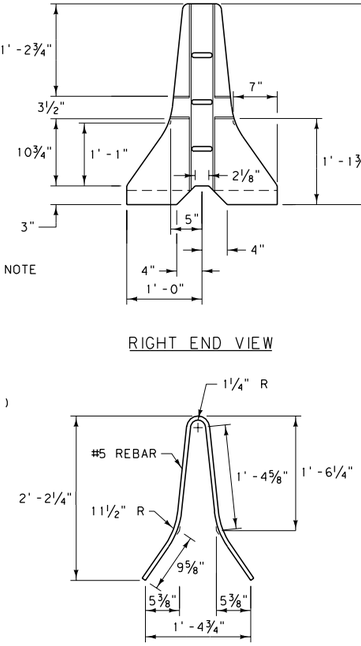
④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ ATTACH REFLECTORS TO RAIL EVERY 30'. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.

⑦ SEE DETAILED DRAWINGS 606-60 AND 606-64 FOR INFORMATION ON THE ADJACENT CONCRETE BARRIER RAIL SECTIONS. THE OPTIONAL TAPERED END DETAIL MAY ALSO BE USED HERE.

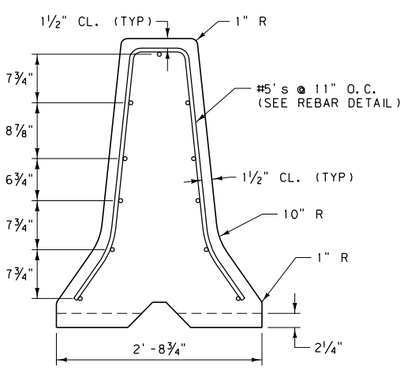
* ¾" CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) ½" CHAMFER IS ACCEPTABLE.



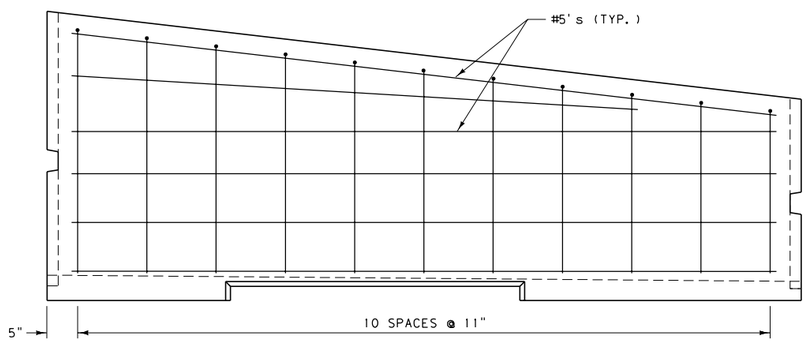
REBAR DETAIL RIGHT END

NOTE:

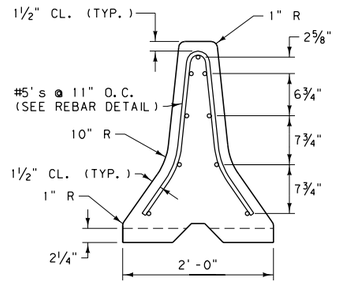
LEFT AND RIGHT REBAR DETAILS ARE FOR NORMAL TALL AND REGULAR CONCRETE BARRIER RAIL SECTIONS. TAPER REBAR HEIGHT AND WIDTH AS NEEDED BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE 1½" CLEARANCE AT ALL LOCATIONS.



LEFT END VIEW

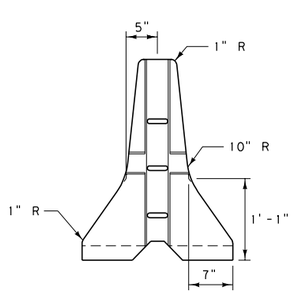


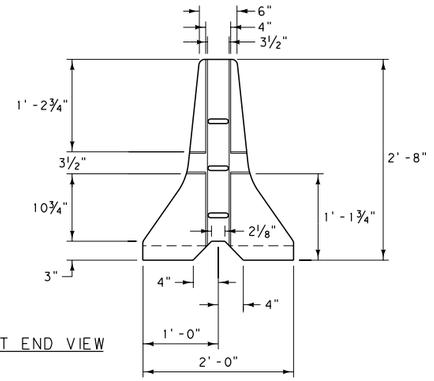
ELEVATION VIEW



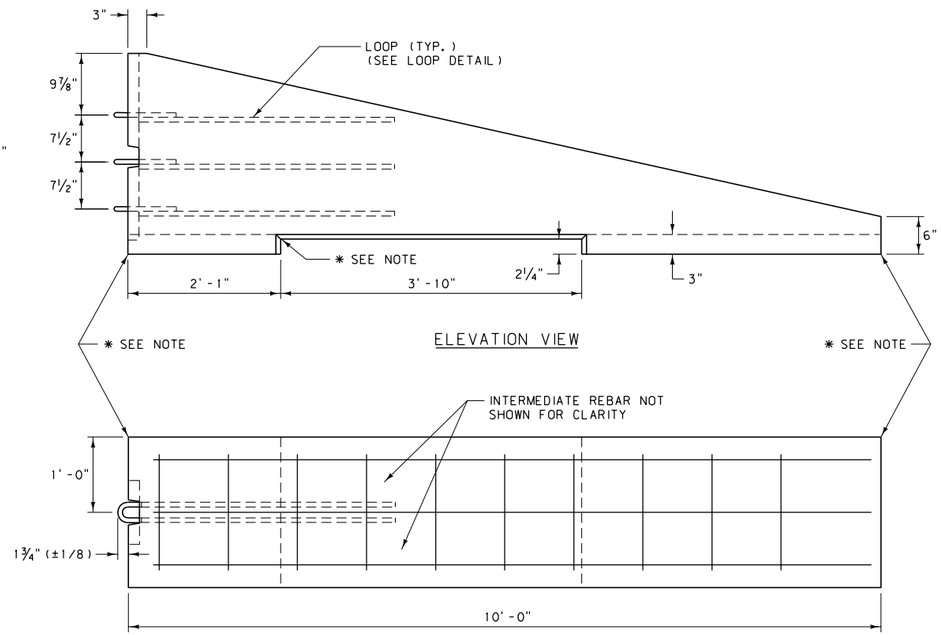
RIGHT END VIEW

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 554, 606	DWG. NO. 606-66
CONCRETE BARRIER RAIL TRANSITION	
--REVISED-- January 2008	EFFECTIVE: FEBRUARY 2005
	MONTANA DEPARTMENT OF TRANSPORTATION (MDT) serving you with pride



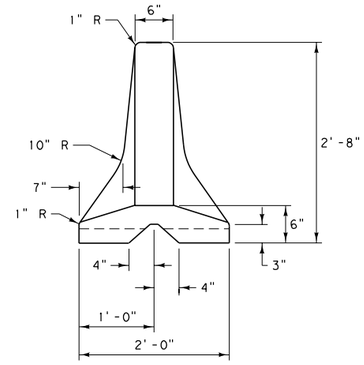


LEFT END VIEW



ELEVATION VIEW

PLAN VIEW



RIGHT END VIEW

NOTE:

REBAR TYPICAL AT LEFT END ONLY. TAPER THE REBAR HEIGHT AS NEEDED, BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE 1½" CLEARANCE AT ALL LOCATIONS.

NOTES:

① USE CLASS "DD" CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31, GRADE 60.

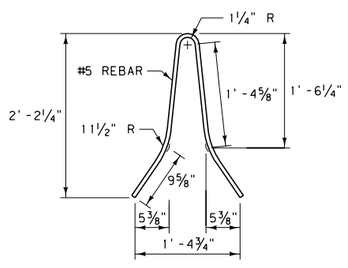
③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270, GRADE 36 OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

④ CUTOUTS ON LEFT END OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

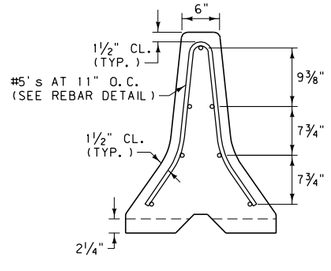
⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ SEE DTL. DWG. NO. 606-60 FOR INFORMATION ON THE ADJACENT CONCRETE BARRIER RAIL SECTION. THE OPTIONAL TAPERED END DETAIL MAY ALSO BE USED HERE.

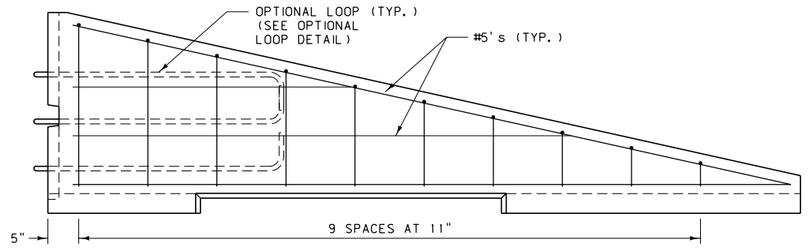
* ¾" CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) ½" CHAMFER IS ACCEPTABLE.



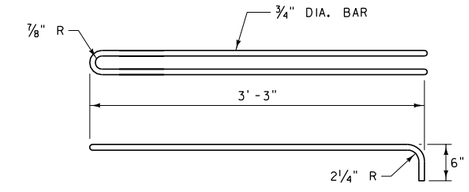
REBAR DETAIL LEFT END



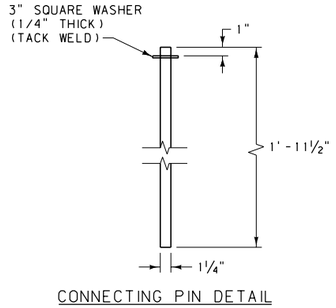
LEFT END VIEW



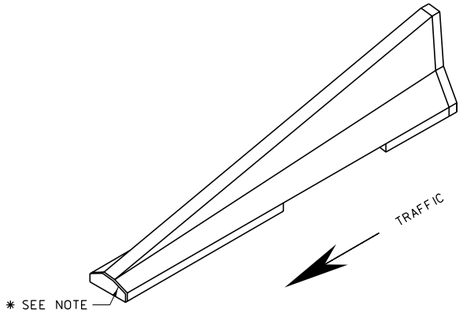
ELEVATION VIEW



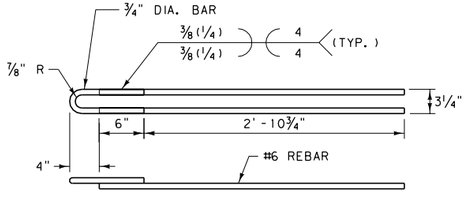
OPTIONAL LOOP DETAIL



CONNECTING PIN DETAIL



ISOMETRIC VIEW



LOOP DETAIL

LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706, GRADE 60 FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36.
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS USING ⅛" DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. USE A CERTIFIED WELDER IN ACCORDANCE WITH THE CURRENT EDITION OF AWS D1.4. DO NOT PLACE THE WELDED ASSEMBLY IN THE FORM UNTIL IT HAS BEEN INSPECTED.
6. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, GRADE 36 TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 554, 606

DWG. NO. 606-68

CONCRETE BARRIER RAIL TERMINAL SECTION (ONE-WAY DEPARTURE)

--REVISED--
January 2008

EFFECTIVE: FEBRUARY 2005

MDT serving you with pride — MONTANA DEPARTMENT OF TRANSPORTATION

SCHEDULE OF GUARDRAIL HARDWARE				DTL. DWGS. WHERE PARTS USED																	
DESIGNATION ①	DESCRIPTION	DTL. DWG. NO. (606-###)	GUARDRAIL TYPE ②	606-05A	606-05B	606-09	606-11A	606-11B	606-18	606-24A	606-24B	606-25A	606-25B	606-40	606-41	606-46	606-50	606-52	606-53	606-53A	606-54	606-58
FBB01-05	5/8" DIA. GUARDRAIL BOLT AND RECESSED NUT	82	W	X	X	X	X	X	X							X						X
FBH01	5/16" DIA. HOOK BOLT	92	C											X								
FBH02	5/16" DIA. ALTERNATE HOOK BOLT	92	C											X								
FBX10a	3/8" DIA. HEX BOLT	82	B														X	X	X	X		X
FBX12a	1/2" DIA. HEX BOLT	82	B, C												X		X	X	X	X		X
FBX14a	9/16" DIA. HEX BOLT	82	B																			X
FBX16a	5/8" DIA. HEX BOLT	82	W						X							X						
FBX20a	3/4" DIA. HEX BOLT	82	W													X						
FBX20b	3/4" DIA. HIGH STRENGTH HEX BOLT	82	B														X		X	X	X	X
FBX22b	7/8" DIA. HIGH STRENGTH HEX BOLT	82	W							X	X											
FBX24b	1" DIA. HIGH STRENGTH HEX BOLT	82	B																	X		
FCA01	CABLE ASSEMBLY	84	W						X							X						
FMM01	CABLE WEDGE	94	C											X								
FMM02	POST SLEEVE	84	W						X							X						
FNS20	3/4" DIA. SQUARE NUT	82	C												X							
FNX08a	5/16" DIA. HEX NUT	82	C											X								
FNX10a	3/8" DIA. HEX NUT	82	B														X	X	X	X		X
FNX12a	1/2" DIA. HEX NUT	82	B, C												X		X	X	X	X		X
FNX14a	9/16" DIA. HEX NUT	82	B																			X
FNX16a	5/8" DIA. HEX NUT	82	W						X							X						
FNX20a	3/4" DIA. HEX NUT	82	C, W												X	X						X
FNX20b	3/4" DIA. HIGH STRENGTH HEX NUT	82	B																X	X	X	X
FNX22b	7/8" DIA. HIGH STRENGTH HEX NUT	82	W							X	X											
FNX24a	1" DIA. HEX NUT	82	W						X							X						
FNX24b	1" DIA. HIGH STRENGTH HEX NUT	82	B																	X		
FPA01	GUARDRAIL ANCHOR BRACKET & END PLATE	84	W						X							X						
FPA02	CABLE ANCHOR BRACKET	95	C												X							
FPB01	BEARING PLATE	18 & 46	W						X							X						
FPP01	BOX BEAM SUPPORT BRACKET	97	B														X	X	X	X		X
FRH20a	3/4" DIA. HOOKED ANCHOR ROD	82	C												X							X
FWC10a	3/8" DIA. FLAT WASHER	82	B														X	X	X	X		X
FWC12a	1/2" DIA. FLAT WASHER	82	B, C												X		X	X	X	X		X
FWC14a	9/16" DIA. FLAT WASHER	82	B																			X
FWC16a	5/8" DIA. FLAT WASHER	82	W	X	X	X	X	X	X							X						
FWC20a	3/4" DIA. FLAT WASHER	82	C, W												X	X						X
FWC20b	3/4" DIA. HARDENED FLAT WASHER	82	B														X		X	X	X	X
FWC24a	1" DIA. FLAT WASHER	82	W						X							X						
FWR03	RECTANGULAR PLATE WASHER	84	W						X													
PDB01	WOOD BLOCKOUT	05A & 05B	W	X	X	X	X	X														
PDE02	WOOD GUARDRAIL POST	05A	W	X			X															
PDE09	CRT POST	46	W			X										X						
PDF01	WOOD BREAKAWAY POST	46	W													X						
PDF03	END POST	18	W						X													
PLS01	SOIL PLATE	92 & 97	B, C											X			X	X	X			
PLS03	SOIL PLATE	46	W													X						
PSE01	CABLE GUARDRAIL LINE POST	92	C											X								
PSE05	TYPE D BOX BEAM POST	97	B																X			
PSE06	CABLE GUARDRAIL ANCHOR POST	95	C												X							
PSE08	TYPE A BOX BEAM POST	97	B														X		X			X
PTE05	STEEL TUBE	46	W													X						
PWE01	STEEL GUARDRAIL POST	05B	W		X			X														
RBM01	BOX BEAM RAIL	98	B														X		X		X	X
RBM05	BOX BEAM TERMINAL RAIL	98	B															X				
RBS01	BOX BEAM SPLICE PLATE	98	B														X					
RCE01	COMPENSATING CABLE END ASSEMBLY	94	C											X								
RCE03	CABLE END ASSEMBLY	94	C												X							X
RCM01	3/4" DIA. CABLE	94	C											X	X							
RWE01a-b	W-BEAM END SECTION (FLARED)	88	W						X													
RWE02a-b	W-BEAM TERMINAL CONNECTOR	88	W							X	X	X	X			X						
RWE06a-b	W-BEAM END SECTION (BUFFER)	88	W													X						
RWM02a-b	W-BEAM (12'-6" LENGTH)	88	W	X	X	X	X	X	X													X
RWM22a-b	W-BEAM (25'-0" LENGTH)	88	W	X	X	X	X	X	X													X
SEC01	CABLE GUARDRAIL TERMINAL ANCHOR ASSEMBLY	41	C											X								

SCHEDULE OF GUARDRAIL HARDWARE				DTL. DWGS. WHERE PARTS USED																	
DESIGNATION ①	DESCRIPTION	DTL. DWG. NO. (606-###)	GUARDRAIL TYPE ②	606-05A	606-05B	606-09	606-11A	606-11B	606-18	606-24A	606-24B	606-25A	606-25B	606-40	606-41	606-46	606-50	606-52	606-53	606-53A	606-54	606-58
N/A	TURNBUCKLE CABLE END ASSEMBLY	94	C											X								
N/A	KEEPER PLATE	95	C												X							
N/A	TYPE B BOX BEAM POST	97	B																X			
N/A	SUPPORT BRACKET WITH TS6 x 6 x 3/16 BLOCKOUT	97	B																	X		
N/A	TRANSITION POST	97	B																	X		
N/A	TS6 x 6 x 3/16 BR. APP. SECT. UPPER RAIL NO. 1	98	B																X			
N/A	TS6 x 2 x 1/4 BR. APP. SECT. LOWER RAIL NO. 1	98	B																X			
N/A	TS6 x 2 x 1/4 BR. APP. SECT. LOWER RAIL NO. 2	98	B																X			
N/A	TS6 x 2 TO TS6 x 6 CONNECTION SLEEVE	98	B																X			
N/A	TS6 x 2 CONNECTION SLEEVE	98	B																X			
N/A	TS6 x 6 x 3/16 TRANSITION RAIL	98	B																	X		
N/A	1/4" SHIM PLATE	99	B																	X		
N/A	ANCHOR RAIL SECTION	99	B																	X		
N/A	RUB RAIL ANCHOR BRACKET (JERSEY RAIL)	99	B																	X		
N/A	RUB RAIL ANCHOR BRACKET (VERTICAL BRIDGE RAIL)	99	B																	X		
N/A	TS6 x 2 x 3/16 RUB RAIL	99	B																	X		

NOTES:

① SEE AASHTO-AGC-ARTBA JOINT COMMITTEE TASK FORCE 13 REPORT "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" PUBLICATION FOR ADDITIONAL AND DETAILED HARDWARE SPECIFICATIONS.

② GUARDRAIL TYPE CODES:

W = W-BEAM METAL GUARDRAIL
C = CABLE GUARDRAIL
B = BOX BEAM GUARDRAIL

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-80

SCHEDULE OF GUARDRAIL HARDWARE

--REVISED--
January 2008

EFFECTIVE: FEBRUARY 2005

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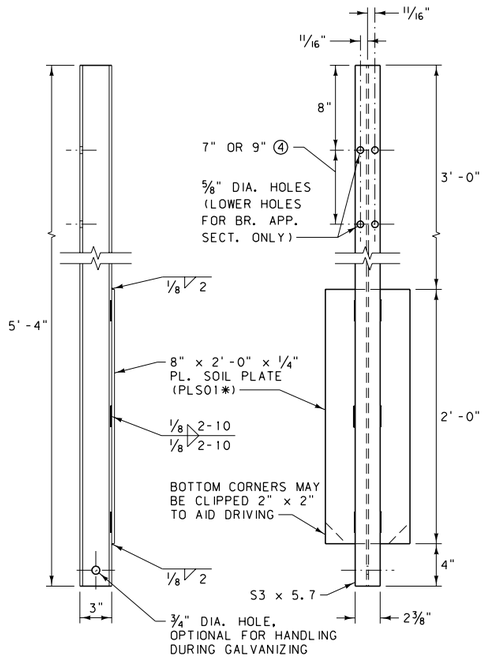
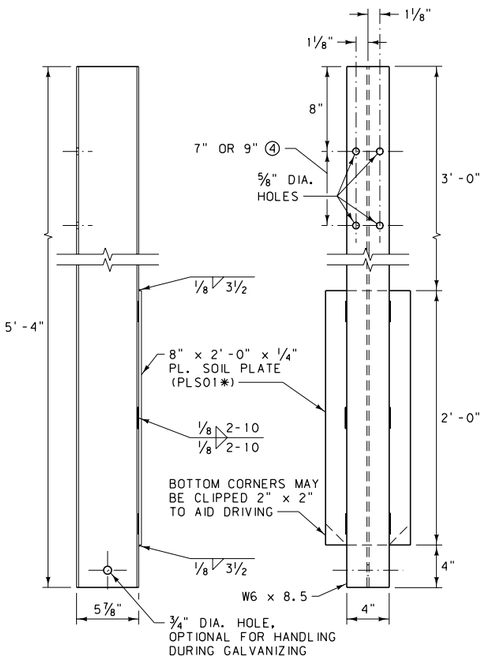


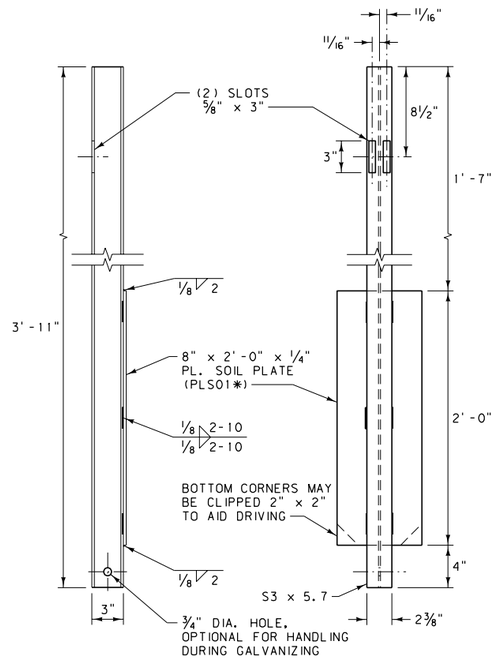
TYPE A BOX BEAM POST AND SOIL PLATE

PSE08* AND PLS01*



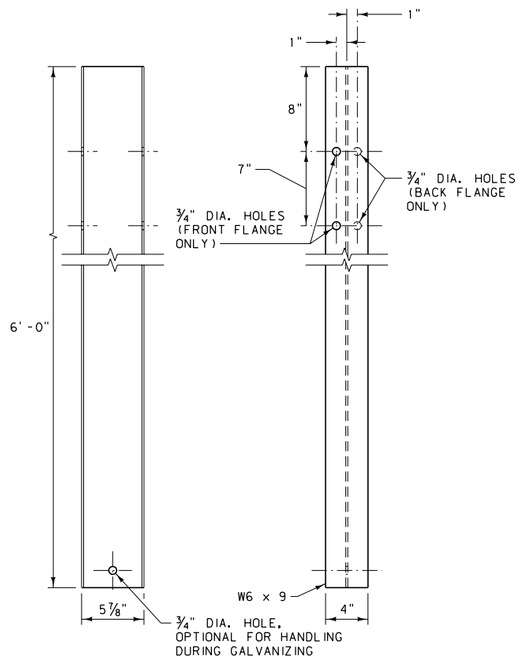
TYPE B BOX BEAM POST AND SOIL PLATE

PLS01*

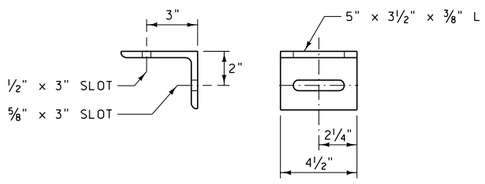


TYPE D BOX BEAM POST AND SOIL PLATE

PSE05* AND PLS01*

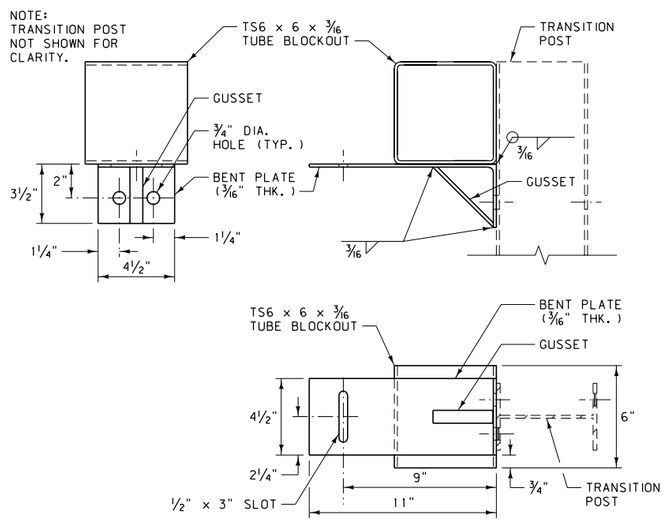


TRANSITION POST

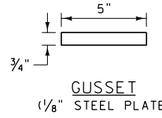


BOX BEAM SUPPORT BRACKET

FPP01*



SUPPORT BRACKET W/BLOCKOUT



GUSSET
(1/8" STEEL PLATE)

NOTES:

① MANUFACTURE POSTS USING STEEL CONFORMING TO AASHTO M 183 (ASTM A 36). MANUFACTURE SOIL PLATES, SUPPORT BRACKETS AND MISC. COMPONENTS USING AASHTO M 270 (ASTM A 709) GRADE 36 STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.

② MANUFACTURE BLOCKOUTS FROM EITHER ASTM A 500 GRADE B COLD-ROLLED TUBING, ASTM A 501 HOT-ROLLED TUBING OR AUTOMOTIVE ROLLOVER PROTECTIVE STEEL (ROPS). WHEN ASTM A 500 GRADE B STEEL IS USED, TEST THE MATERIAL PER ASTM E 436.

③ GALVANIZE FABRICATED POSTS, BLOCKOUTS, BRACKETS AND MISC. COMPONENTS IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

④ SEE DTL. DWG. NO. 606-53 (BOX BEAM BR. APP. SECT.) FOR REQUIRED LOCATION OF LOWER HOLES IN TYPE A AND B POSTS.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-97

BOX BEAM GUARDRAIL HARDWARE

--REVISED-- January 2008

EFFECTIVE: FEBRUARY 2005

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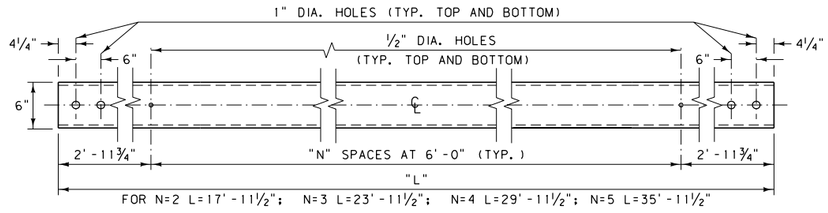
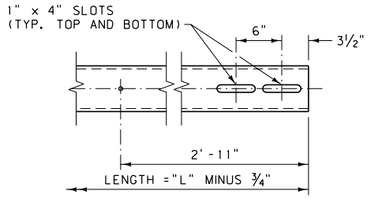


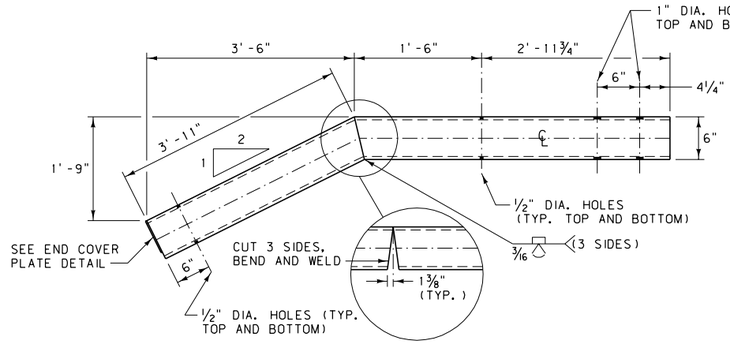
BOX BEAM RAIL (TS6 x 6 x 3/16)

RBM01*



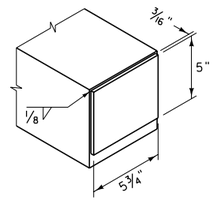
BOX BEAM EXPANSION SPLICE END

ONE END OF BOX BEAM RAIL ONLY. REQUIRED FOR BOTH RAILS AT THE EXPANSION SPLICE.



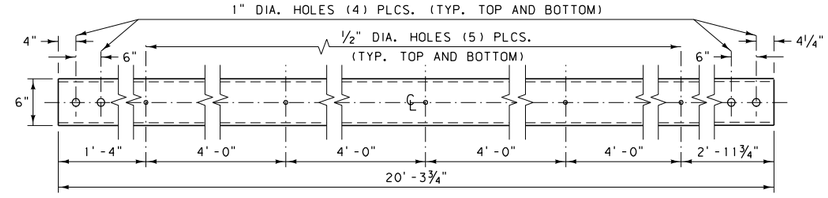
BOX BEAM TERMINAL RAIL (TS6 x 6 x 3/16)

RBM05*

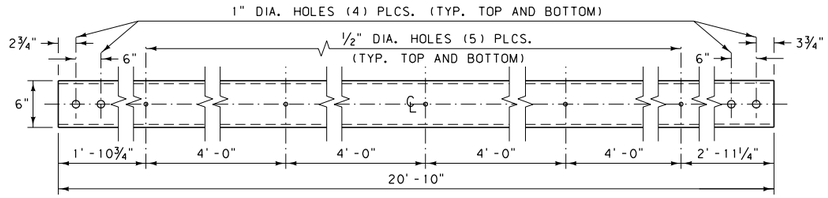


END COVER PLATE DETAIL

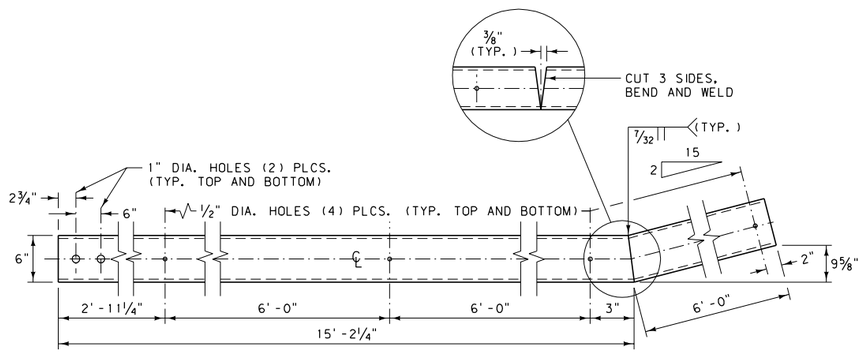
(BAR 5" x 3/16" x 0' - 5¾")



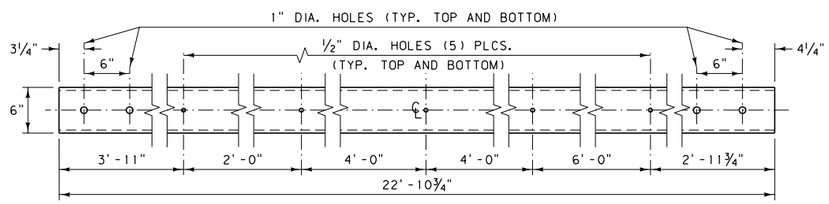
TS6 x 6 x 3/16 BR. APP. SECT. UPPER RAIL NO. 1



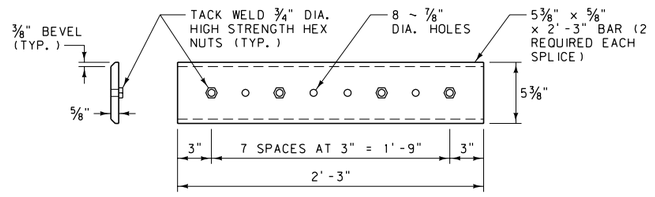
TS6 x 2 x ¼ BR. APP. SECT. LOWER RAIL NO. 1



TS6 x 2 x ¼ BR. APP. SECT. LOWER RAIL NO. 2

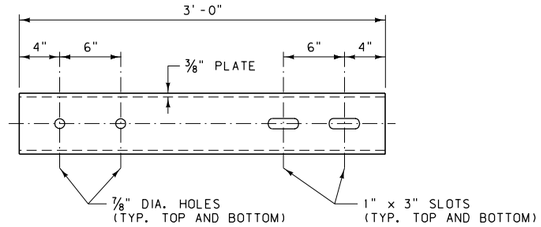


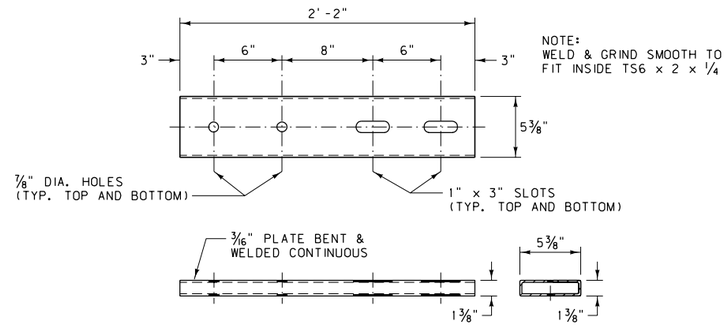
TRANSITION RAIL (TS6 x 6 x 3/16)



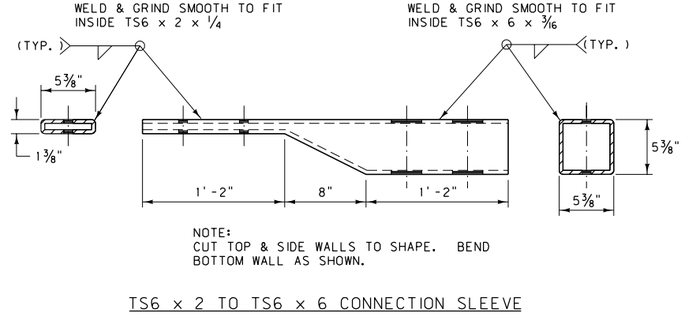
BOX BEAM SPLICE PLATE

RBS01*

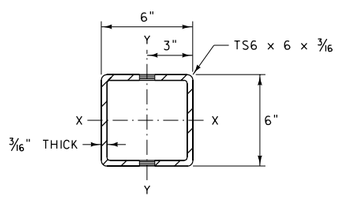




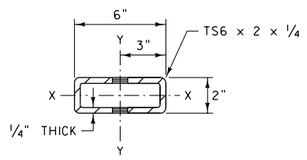
TS6 x 2 CONNECTION SLEEVE



TS6 x 2 TO TS6 x 6 CONNECTION SLEEVE



TS6 x 6 x 3/16 SECTION VIEW



TS6 x 2 x ¼ SECTION VIEW

NOTES:

1. MANUFACTURE BOX BEAM RAIL ELEMENTS FROM EITHER ASTM A 500 GRADE B COLD ROLLED TUBING, ASTM A 501 HOT-ROLLED TUBING OR AUTOMOTIVE ROLLOVER PROTECTIVE STEEL (ROPS). WHEN ASTM A 500 GRADE B STEEL IS USED, TEST THE MATERIAL PER ASTM E 436.
2. FABRICATE SPLICE PLATES AND CONNECTION SLEEVES FROM AASHTO M 270 (ASTM A 709) GRADE 36 STEEL PLATE. THE NUTS ARE TO BE PLAIN UN-COATED ¾" DIA. HIGH STRENGTH HEX NUTS. WELD THE NUTS TO THE PLATES IN ACCORDANCE WITH THE APPLICABLE AWS CODE.
3. GALVANIZE FABRICATED RAIL, CONNECTION SLEEVES, AND SPLICE PLATES IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

*SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-98

BOX BEAM GUARDRAIL HARDWARE

--REVISED-- January 2008

EFFECTIVE: FEBRUARY 2005

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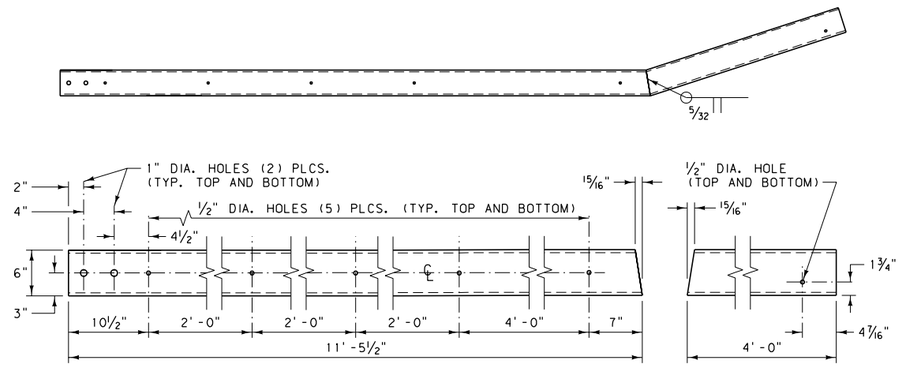
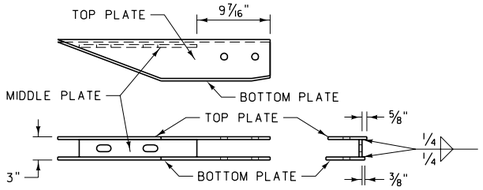
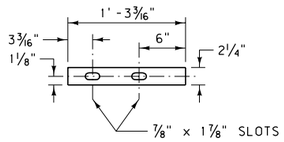


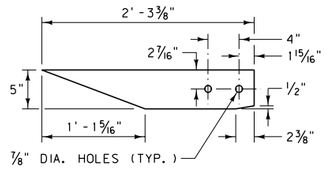
RUB RAIL (TS6 x 2 x 3/16)



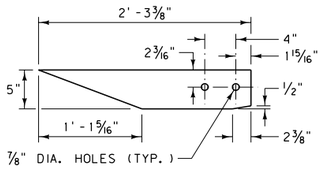
ANCHOR BRACKET FOR RUB RAIL CONNECTION TO JERSEY SHAPE BRIDGE RAIL



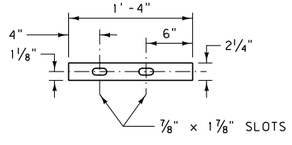
MIDDLE PLATE
(3/8" STEEL PLATE)



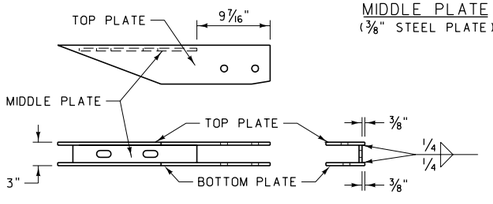
TOP PLATE
(3/8" STEEL PLATE)



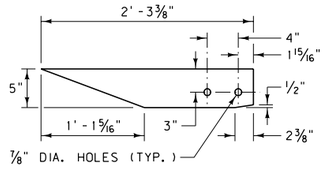
BOTTOM PLATE
(3/8" STEEL PLATE)



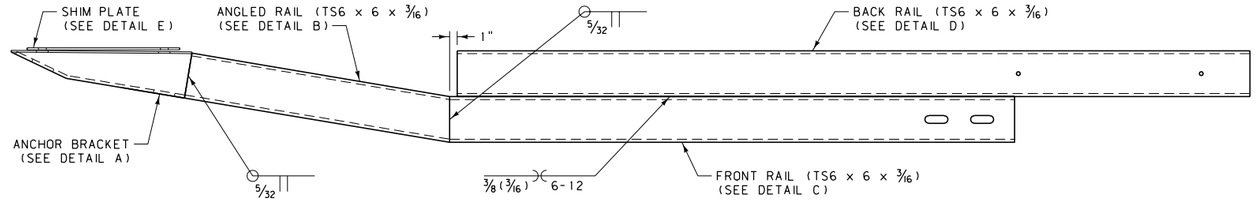
MIDDLE PLATE
(3/8" STEEL PLATE)



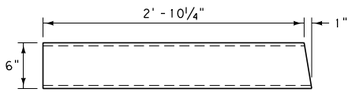
ANCHOR BRACKET FOR RUB RAIL CONNECTION TO VERTICAL CONCRETE BRIDGE RAIL



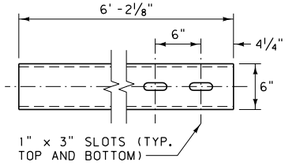
TOP PLATE AND BOTTOM PLATE
(TOP AND BOTTOM PLATES ARE IDENTICAL 3/8" STEEL PLATES FOR CONNECTIONS TO VERTICAL SHAPES.)



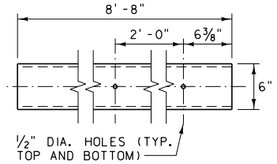
ANCHOR RAIL SECTION



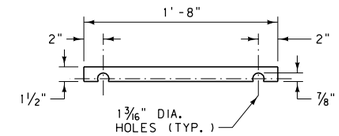
DETAIL B
ANGLED RAIL (TS6 x 6 x 3/16)



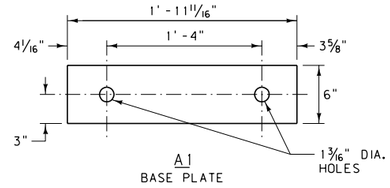
DETAIL C
FRONT RAIL (TS6 x 6 x 3/16)



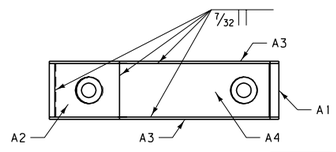
DETAIL D
BACK RAIL (TS6 x 6 x 3/16)

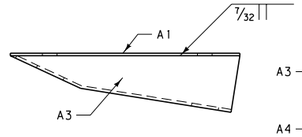


DETAIL E
SHIM PLATE (1/4" STEEL PLATE)

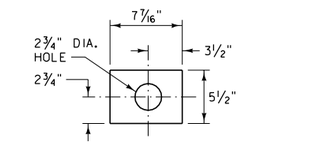


A1
BASE PLATE

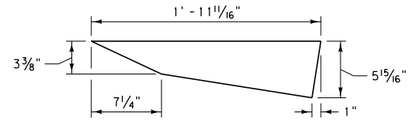




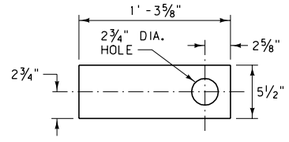
DETAIL A
ANCHOR BRACKET



A2
FRONT LEFT PLATE

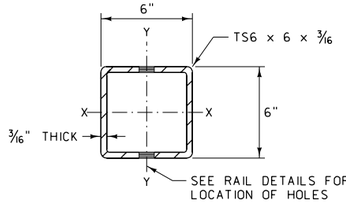


A3
TOP AND BOTTOM PLATE

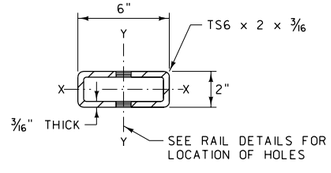


A4
FRONT RIGHT PLATE

NOTE:
ALL ANCHOR BRACKET COMPONENTS ARE FABRICATED FROM 1/4" STEEL PLATE MATERIAL.



TS6 x 6 x 3/16 SECTION VIEW



TS6 x 2 x 3/16 SECTION VIEW

NOTES:

1. MANUFACTURE BOX BEAM RAIL ELEMENTS FROM EITHER ASTM A 500 GRADE B COLD ROLLED TUBING, ASTM A 501 HOT-ROLLED TUBING OR AUTOMOTIVE ROLLOVER PROTECTIVE STEEL (ROPS). WHEN ASTM A 500 GRADE B STEEL IS USED, TEST THE MATERIAL PER ASTM E 436.
2. FABRICATE ANCHOR BRACKET AND RUB RAIL CONNECTION COMPONENTS FROM AASHTO M 270 (ASTM A 709) GRADE 36 STEEL PLATE.
3. GALVANIZE FABRICATED RAIL, ANCHOR BRACKET, AND RUB RAIL CONNECTION COMPONENTS IN ACCORDANCE WITH AASHTO M 111 (ASTM A 123). NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 606

DWG. NO. 606-99

BOX BEAM GUARDRAIL HARDWARE

--REVISED--

EFFECTIVE: JANUARY 2008

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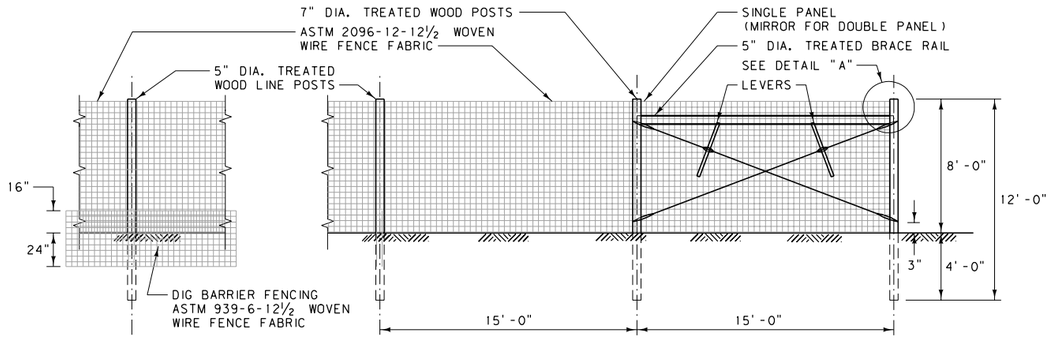
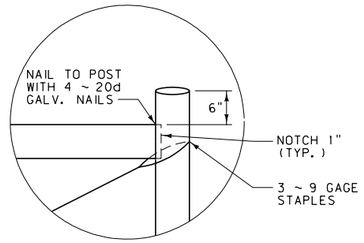


WILDLIFE FENCE W/ DIG BARRIER

PANELS NOT SHOWN

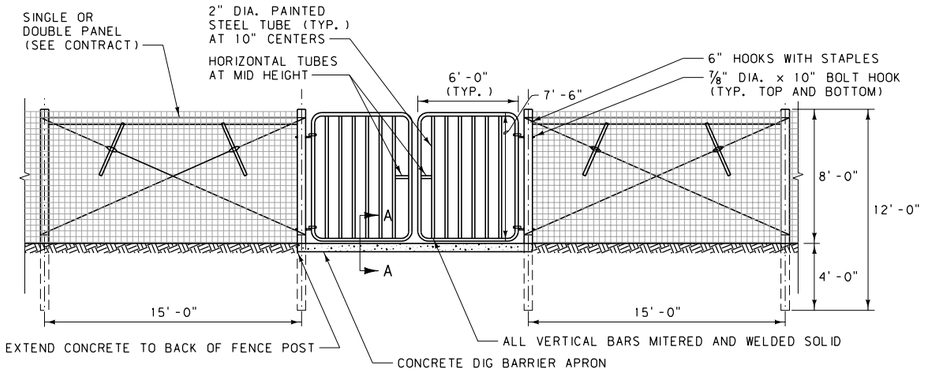
WILDLIFE FENCE



DETAIL "A"

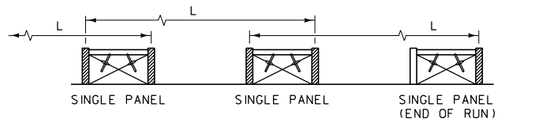
BRACE WIRES - ONE CONTINUOUS 9 OR 12½ GAGE SMOOTH WIRE DOUBLED TO FORM A FOUR WIRE BRACE. TIE THE TWO ENDS NEAR THE TOP OF THE PANEL POSTS.

LEVERS - 1½" x 2" x 12" MINIMUM SIZE.



METAL MAINTENANCE ACCESS GATE

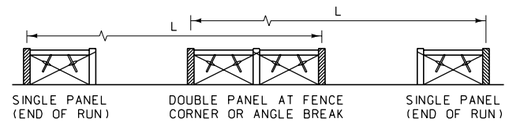
CHAIN AND LOCK TO BE SUPPLIED BY MDT FORCES



FENCE TYPE	RUN = L	PANELS REQUIRED
WILDLIFE	LESS THAN 30'	NONE
	30'-330'	SINGLE

NOTE:

TIE OFF ON ALL CROSS HATCHED OR SHADED POSTS.



FENCE PANEL TYPES

NOTES:

PLACE ALL FENCE WIRE ON PASTURE SIDE OF POST, EXCEPT ON CURVES. THEN, PLACE THE WIRE ON THE OUTSIDE OF THE CURVE.

POST SPACING IS GENERALLY MEASURED PARALLEL TO GROUND.

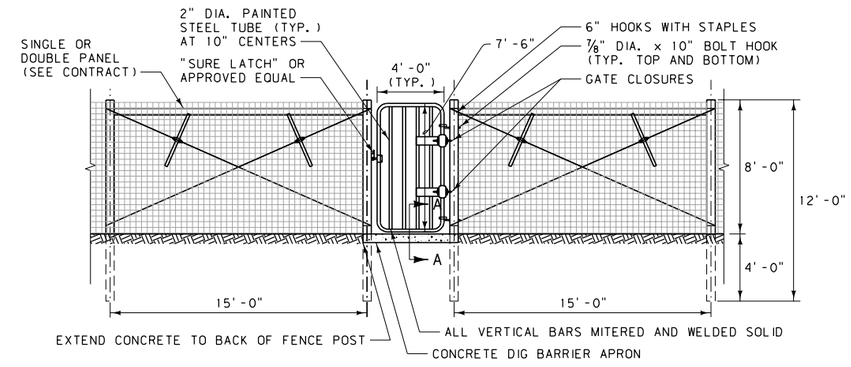
LINE POST SPACING IS 15'-0" CENTER TO CENTER. LINE POST SPACING FROM BRACE OR PANEL POST IS 15'-0" CENTER TO CENTER.

TO ATTACH WOVEN WIRE TO AN END POST, REMOVE TWO OR THREE VERTICAL STAY WIRES FROM THE END OF THE FENCE. PLACE THE FIRST COMPLETE VERTICAL STAY WIRE AGAINST THE POST. START AT THE MIDDLE OF THE HORIZONTAL LINE WIRES, WRAPPING AROUND THE END POST AT LEAST TWO TIMES AND THEN WRAPPING AROUND ITSELF FIVE TIMES.

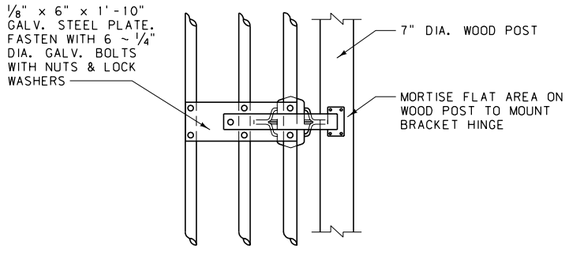
A DEADMAN MAY BE A PRECAST CONCRETE BLOCK, A CAST IN PLACE CONCRETE BLOCK, A ROCK OR OTHER APPROVED OBJECT WEIGHING AT LEAST 260 LB. BURY THE DEADMAN IN THE GROUND WITH AT LEAST 2'-0" OF COVER. ATTACH THE DEADMAN TO THE FENCE WITH 3 STRANDS OF 9 GAGE WIRE OR 6 STRANDS OF 12½ GAGE WIRE. SEE DTL. DWG. NO. 607-10 FOR ALTERNATE DEADMAN.

STAPLE THE BOTTOM, TOP, CENTER AND ALTERNATE WIRES OF WOVEN WIRE TO WOOD LINE POSTS.

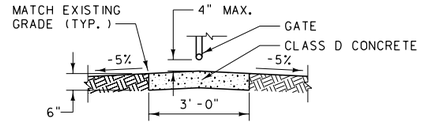
STAPLE ALL WIRES OF WOVEN WIRE TO WOOD CORNER POSTS OR POST USED TO TIE-OFF WIRE.



METAL EQUINE GATE



TIE BAR MOUNTING DETAIL FOR GATE CLOSERS



SECTION A-A

CENTER CONCRETE DIG BARRIER APRON UNDER CLOSED GATE

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 607

DWG. NO. 607-50

WILDLIFE FENCE

--REVISED--
January 2008

EFFECTIVE: APRIL 2006

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